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## BACTERIAL VACCINE THERAPY IN SURGERY

A REPORT OF A SERIES OF INVESTIGATIONS COVERING WORK OF THE LAST EIGHT MONTHS MADE WITH A VIEW TO DETERMINE THE VALUE OF VACCINE THERAPY IN THE TREATMENT OF SURGICAL INFECTIONS


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WITH FULL LABORATORY REPORTS

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## I. GENERAL CONSIDERATIONS

BY DR. MCARTHUR

WHEN the human organism becomes invaded by an infective element, Nature's effort to resist or overcome the same is made in one or more of the following ways:

By means of Bacteriolysins;
By means of Bacteriocidins;
By means of Agglutinins;
By means of Antitoxins;
By means of Phagocytosis.

If it be borne in mind that for the more common surgical infections, such as tuberculosis, staphylococcus, gonococcus, colon bacillus, streptococcus, etc., *phagocytosis* is the chief, if not the only, means by which such invasions are combated, it will be plain why the surgeon should be deeply interested in this subject, explain why we have devoted so much time, labor, and money in investigating its merits, as well as justify our efforts to present those results before this body.

Those of us who have profited during the past few years by the inestimable aid gleaned by the mere knowledge that the invasion of infective organisms induces a leucocytosis, cannot fail to see the importance which must attach to any means which shall at the same time multiply the phagocytic power of this great increase of combating elements.

That we can so increase the phagocytic power is now beyond cavil, is capable any day of demonstration, and forms the means by

which the therapeutic application of vaccine can be controlled, as well as offers another aid in the diagnosis of the nature of the infective element.

That diagnosis has scored a distinct advance through the aid of the opsonic index I feel cannot now be successfully gainsaid, our many repeated and crucial experiments convincing us of their general accuracy. Just as in the earlier days of the leucocyte count in infections correct interpretations could not always be made, thus casting doubt on the value of the method as a whole, so to-day there remain some vagaries of the index yet to be explained, leading some to deprecate the whole because of the present lack of knowledge of a part.

Advance in diagnosis has been along two lines:

1. Avoidance of administration of more or less noxious diagnostic agents;

2. Laboratory determination of obscure infections.

Take for example the diagnosis of an obscure tuberculosis; in the past few years this has been done by the administration of, by no means harmless, injections of tuberculin, gradually increased until large doses fail of a reaction. Such administration has been aptly likened to "a search for a gas leak with a lighted candle," since from a resulting exacerbation of the local process acute dissemination of the disease, or even death, has followed. By the newer methods some of the patient's blood, abstracted as for a leucocyte count, is taken to the laboratory. The capacity of his serum to prepare stock tubercle bacilli for ingestion by leucocytes is compared with that of normal serum. If he is tubercular, it varies from the normal (three successive examinations are always made), the direction and degree being dependent on several factors, chief of which are (1) localized infection, (2) systemic infection, (3) activity of process. This diagnostic knowledge is gained without administration to the patient of anything.

It would seem appropriate at this point to refer to an interesting observation made in my clinic in a case in which the combined efforts of the staff of St. Luke's, after exhausting all recognized diagnostic means and instruments of precision, led only to a tentative diagnosis of a peritoneal tuberculosis and explorative laparotomy. Although the opsonic index to human tubercle bacilli had in this case shown itself repeatedly normal, the clinical findings revealed a miliary tuberculosis, starting in the appendix. This being the first failure of the opsonic index to correspond with the clinical findings we had met with, it stimulated our search for a correct explanation, which we believe we have found in the fact that the patient's index was persistently low to the bovine bacillus, as illustrated in Table 30.

We believe that we have here a probable means of differentiating between the bovine infections and the human bacillus, as well as another proof that such bovine infection of the human does occur. Bonome, by a very complicated reaction with precipitins, has similarly shown that these two infections can successfully be differentiated, while the mere taking of the index has sufficed with us. Similarly, in cases of obscure arthritis, the gonococcal opsonic index has revealed its nature, while the determination of the index as normal for the other potential infective elements added confirmatory negative evidence.

There is one unfortunate phase of the use of the opsonic index and vaccine therapy. It cannot from the very nature of the technic be determined by the busy practitioner. It not only requires a special training, much time and a carefully conducted laboratory, but the number of cases controlled by any one expert is limited to the ten or fifteen to which he must give up his entire time. It has been necessary, therefore, in order to make these researches, to enlist the continuous services of Drs. Lincoln, Vail, Hagans, Line and Miss Maloney, to whose untiring zeal, unlimited patience and enthusiasm to know the truth, the medical profession is indebted for what there is of value in what we offer.

In spite of the fact that the busy practitioner cannot make these determinations for himself, it still remains true that he can utilize both the diagnostic and therapeutic values as they may appear, provided he be within a few hours' reach of a well-equipped laboratory. For just as he now sends his suspected typhoid blood or diphtheritic culture to the laboratory and receives his diagnosis by telephone, wire or mail, so can he send his patient's blood in a

capillary glass tube provided for that purpose, have the index to the suspected organism determined, and, if found varying from the normal, secure the appropriate vaccine which he can himself administer. In this manner it has been possible for us in many instances to aid those interested in this research within a radius of a hundred miles.

I, for one, desire to enter a plea for the addition to every municipal laboratory of an opsonic department to which we might send our sera for examination, our smears for identification, and in return receive properly prepared vaccines, either autogenous, or stock, with which we may determine for ourselves the future of vaccine therapy. Surely the burden of such work ought not to fall upon the individual.

The results of our work uninfluenced by our enthusiasm, the good with the bad, I leave to my colleague, Dr. Hollister, to present to your consideration; if they have merit, most of it is due to his personal control of and interest in the work.

The cases are reported not so much for the purpose of establishing percentages of cures, etc. (the observative time of many of them has as yet been too short), but more for the comparison of the opsonic index with the clinical results of various individuals. In drawing conclusions from the case results, it has been our aim to be as conservative as possible, and to what seems to be the value of such therapy as based upon the actual findings so far as we have gone.

## II. MORE SPECIFIC CONSIDERATIONS — CLINICAL REPORTS

By Dr. Hollister

This part of our present joint paper will cover:

1. Case reports — with charts showing opsonic index curves and brief clinical findings before vaccine therapy was begun and after innoculations were stopped, or to date. It is well to say here that no usual surgical procedure indicated in the various cases has been neglected because of the administration of vaccine. Proper hygiene and diet have been given. It has been our object to ascertain the value, if any, of the use of vaccines in addition to the usual methods of surgical procedure. Most of the cases of tuberculosis have been clinically long drawn out. This is also true of some of the staphylococcus cases and those of colon bacillus where other means of getting relief have failed. The value of conclusions drawn is, therefore, all the greater. Only those cases are reported in which the vaccines have been systematically and regularly administered.
2. General clinical conclusions.
3. Notes upon vaccine therapy of gonococcus infections.
4. A table showing a relation between passive hyperemia and vaccine therapy.
5. Final remarks.

### *I. Case Reports*

The eleven cases of tuberculosis shown on charts in Figs. 14 to 24 inclusive were observed in Dr. Ridlon's service at the Home for Destitute and Crippled Children, Chicago. The following summary and conclusions are given by Dr. Ridlon. We wish to thank Dr. Ridlon for his courtesy, interest and personal efforts to obtain such accurate clinical data. Thanks are also due to Drs. Bailey and Young and Miss Phillips at the Home for their assistance in collecting the data.

"Two cases were selected that had been growing steadily worse for some months and might reasonably be expected to die within less than a year, to determine if the treatment would save their lives; 5 cases had sinuses that had been discharging from 6 months to several years, and might be expected to discharge for yet many months, to determine if the treatment would hasten the healing of the sinuses; 3 cases had unopened abscesses of moderate size, and we wished to determine if the treatment would cause the disappearance of these abscesses; one case was chosen in which I believed the bone disease to be primarily due to syphilis, and one case in which I believed the bone disease to be due to inherited syphilis, to learn if possible the relation of the opsonic index in these cases to those having unquestionable tubercular joint disease; and one case was chosen for purposes of diagnosis where a stiff knee and a subsequent abscess had fol-

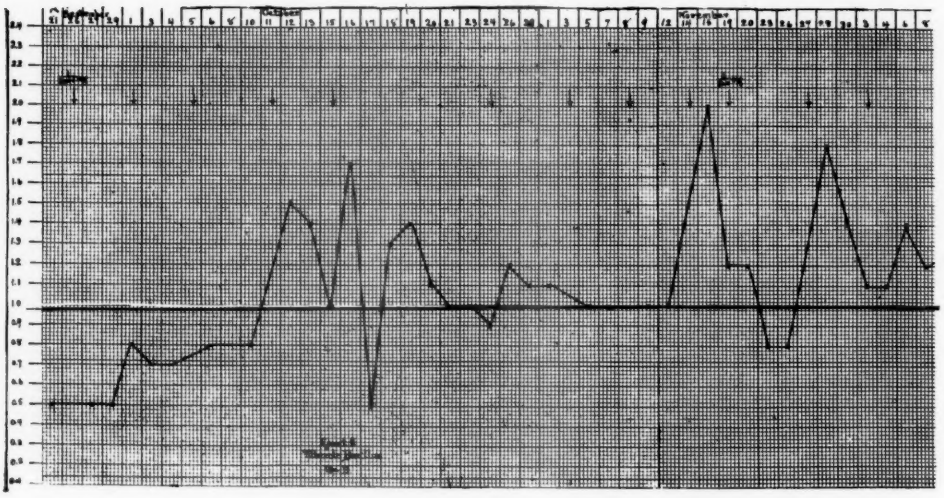


Fig. 1.

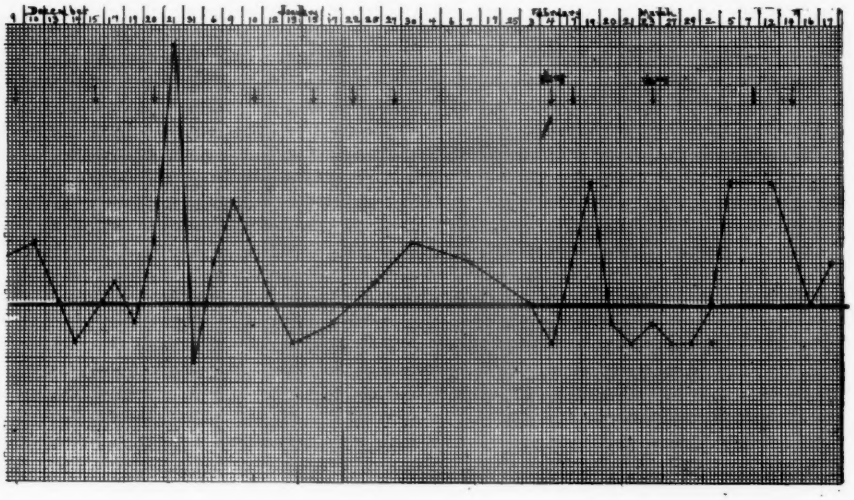


Fig. 1 (continued).

Fig. 1. Mr. B. Age 43. Oct. 1906. Emaciated adult. Weight, 87 pounds. Cervical Pott's disease, with spinal pressure symptoms and with left pulmonary apex invasion. Many bacilli in sputum. Remained in the hospital until Dec. 20th with both extension on head while in bed and "Jury Mast" brace when up and about. Had injections from Sept. 26, 1906, to January '07 and then irregularly (away from careful supervision) to date. As far as one can judge, there has been no improvement in this case other than could be attributed to extension and general hygiene.

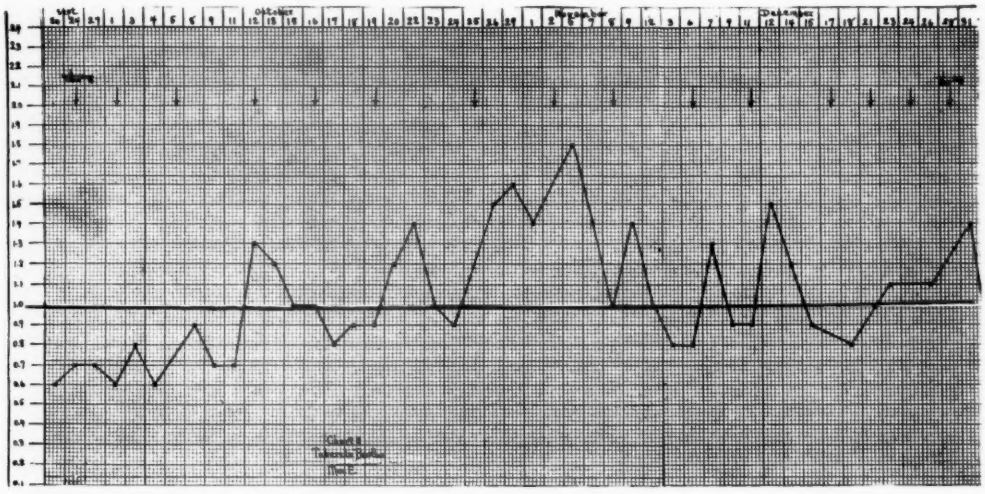


Fig. 2.

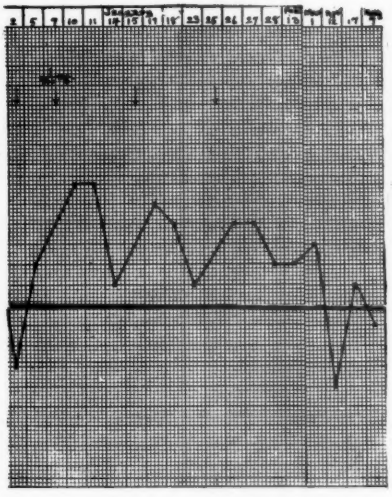


Fig. 2 (continued).

Fig. 2. Mrs. E. Age 26. Tuberculosis left kidney — nephrectomy August, '05. Persistent sinus. Operation to remove fistula May, '06. No result.

Sinus persisting when vaccines were begun. Further operation being considered, injections were continued from Sept. '06 to Dec. '06. Sinus closed after 2 months and with exception of one interval of 4 or 5 days when a few drops of fluid exuded, it has remained closed ever since (3 mos.) General strength, steadily improving. Gain of 15 lbs. in last few months. Patient at least attributes recovery to the vaccine.

lowed osteoclasis of the lower end of the femur for the correction of rachitic knock-knee.

These cases included chronic disease of the ankle, knee, hip, spine, and shoulder. All these patients were examined by me, and their conditions noted prior to the beginning of treatment; they were examined once during the treatment and again at the end of 3 months from the beginning of treatment. At this time all the patients were feeling better, eating better, and had better color and fuller cheeks. All but one had gained in weight, from 2 to 8 lbs., and the one who had not gained in weight had not lost. The tuberculous sinuses had perhaps healed a little more rapidly during the tuberculin treatment, but I do not think that they have improved any more rapidly than one would expect from the generally improved condition of the patients. The abscesses had developed more rapidly than I would have expected under routine treatment, and it has seemed to me that one or two abscesses have appeared that might not have appeared had the tuberculin treatment not been given. The patients in good physical condition, even if they had had joint-disease for years and sinuses for months, showed an opsonic index only a little below normal. The patients with chronic joint-disease and suspected syphilis

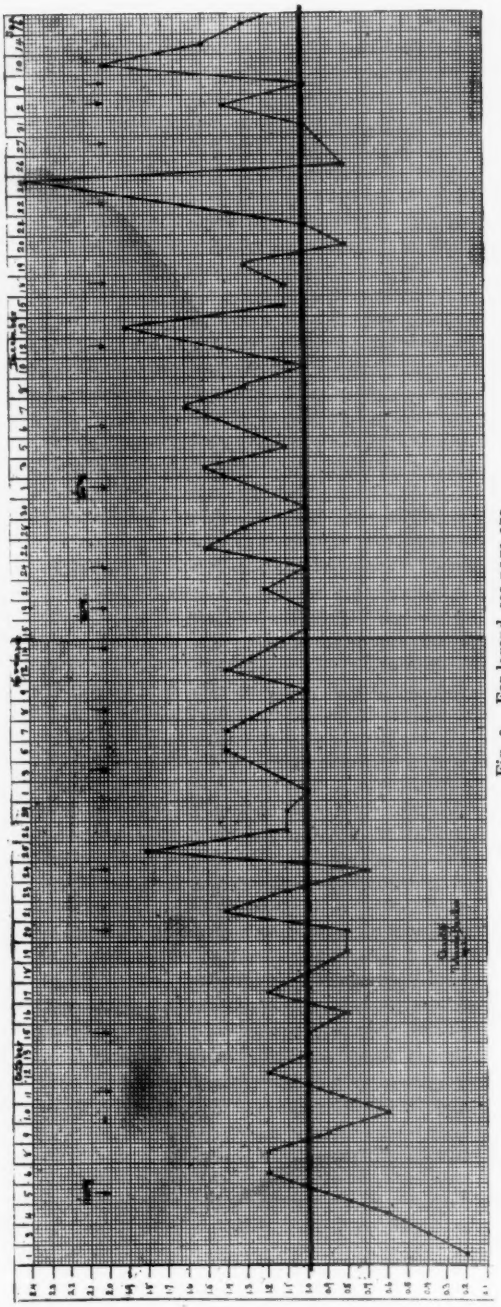


Fig. 3. For legend, see page 379

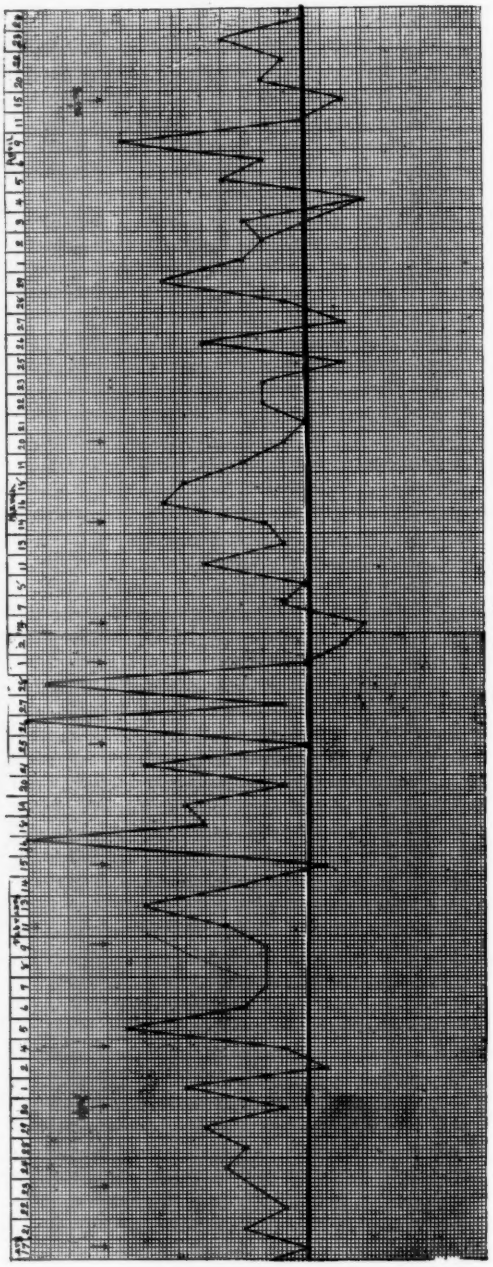


Fig. 3 (continued).

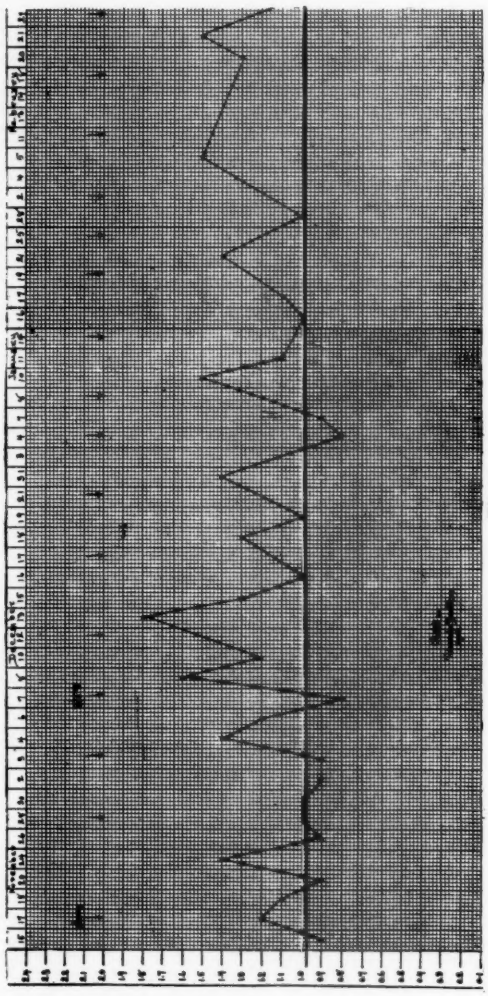


Fig. 3 (continued).

Fig. 3. Mr. L. Age 28. Condition October, 1906. Right tuberculous pleurisy with great effusion; two years' duration before being accurately diagnosed. Tuberculosis of right shoulder joint. Tuberculosis of mid-dorsal region (Pott's). Double psoas abscess. Abscesses opened and drained, improving under injection treatment and general hygienic care. Emaciation marked.

Condition June 1, 1907. Still confined to bed in hospital and to reclining chair. Able to sit up but a few moments at a time. Abundant secretion from pleural cavity, the large size of which persists. Abundant discharge of pus from fistula in left groin from the psoas abscess; afternoon temperature daily 100 to 101.

The only gain in this case that can be noted is persistent excellent appetite, some increase in weight and improvement in mentality.

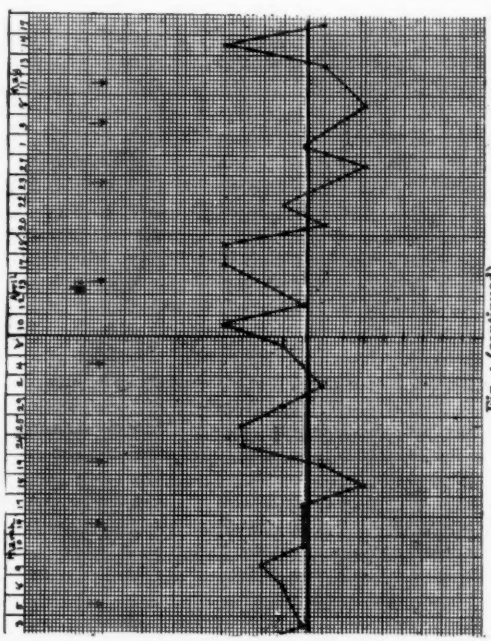


Fig. 4 (continued).

Fig. 4.

Besides the tuberculin this patient has been given staphylococcus, colon bacillus and pyocyaneous vaccines.

Fig. 4. Mr. B. Age 25. Arthritis right elbow, began after typhoid in January, 1900, called "Rheumatism," and "Green Stick Fracture." Grew steadily worse. In 1902 Dr. Podstata diagnosed the condition tuberculous arthritis of synovial membrane. X-Ray, dry hot air and California climate for a year. Consulted Dr. McArthur Oct. '03. Thickening of synovial membrane of elbow joint at that time. Advised X-Ray treatment. Under the X-Ray treatment and fixation by plaster cast the effusion in great part disappeared and the usefulness of the hand was restored. Motion at elbow had at all times been distinctly limited. Because of an exacerbation, as shown by pain, stiffness, he returned in 1906 and the opsonic therapy was added to his other treatment. The X-Ray was discontinued because of atropic changes in the skin. Bier bandage also applied Oct. '06. Worn for 6 to 8 hours daily until May, '07. He writes July 8, '07: "My arm is gradually growing stronger, have good motion in elbow, swelling is reduced and I have very little pain. General health is first class."

Occasional comparative plaster casts of joint have shown constant decrease in joint swelling.

This case is reported not because one can be absolutely sure that present marked result is due to either the vaccine or the bandage or to general hygiene and diet, but because the combination of all three has been of very distinct value in the at least temporary improvement.

Fig. 5. Miss M. Age 24. Report, December, 1906. Cervical Pott's disease; posterior mediastinal abscess burrowing through diaphragm; subdiaphragmatic abscess; drainage of latter, followed in ten days by fecal fistula; fistula persisting, patient consulted the author; to correct fistula, resection of ileum at ileocecal region; end-to-end

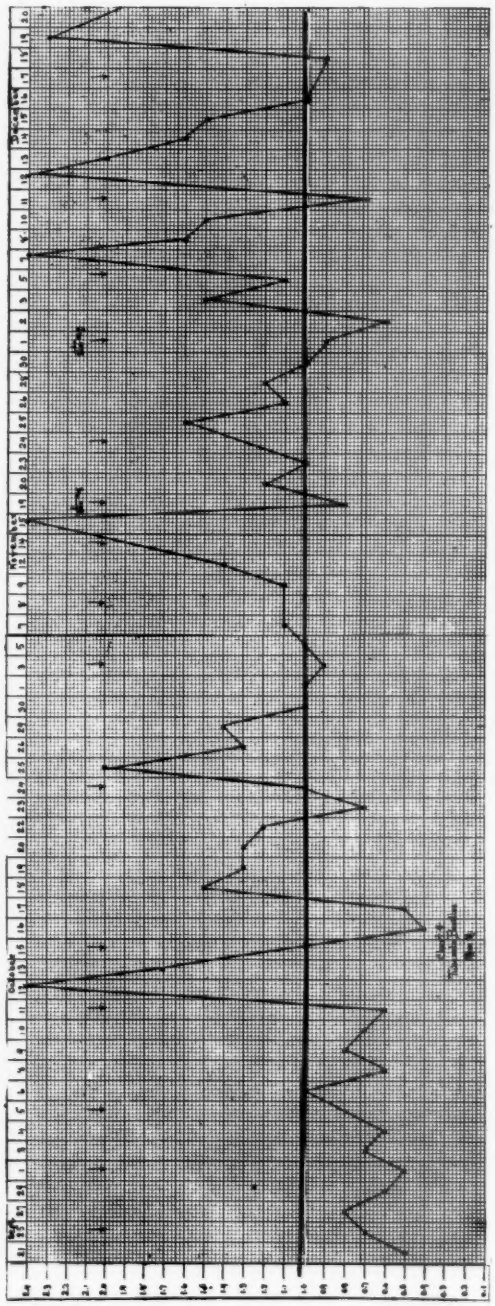


Fig. 5. For legend, see page 381.

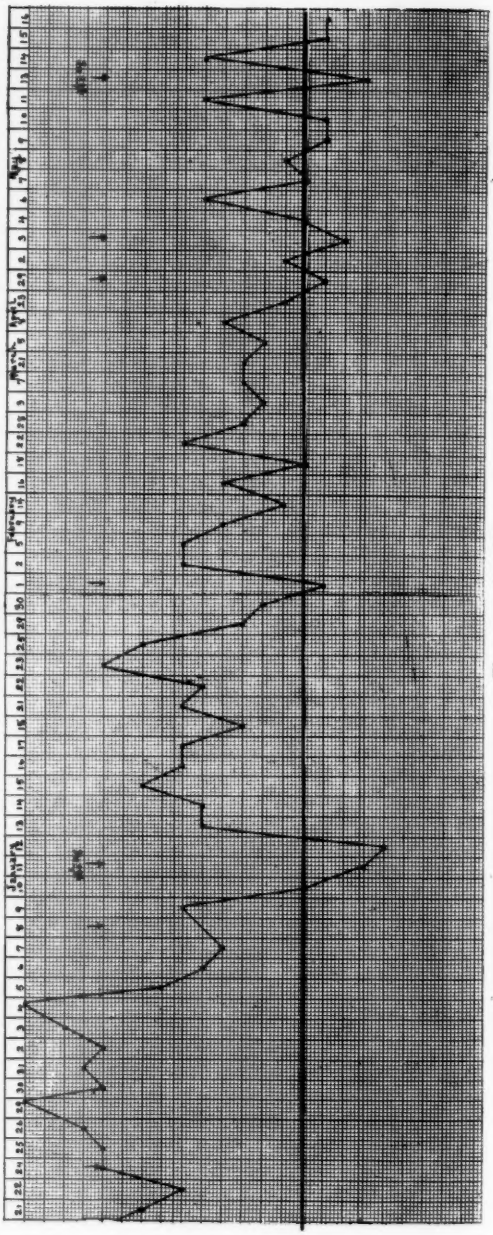


Fig. 5 (continued).

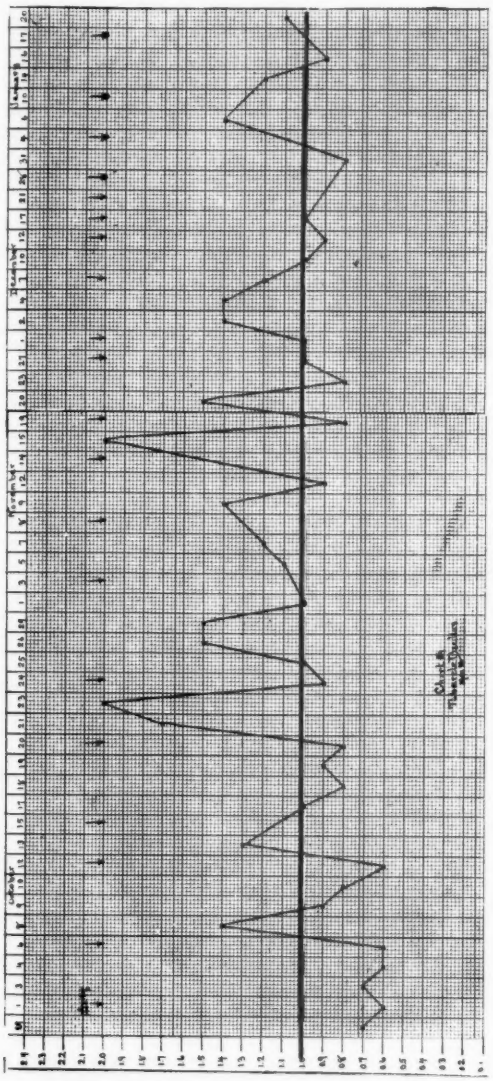


Fig. 6.

implantation of same in sigmoid. Retroperistalsis made this procedure a failure. Exposure of the hepatic flexure of the colon and suture of the bowel perforation successful at second trial. Persistence of fistulous tract through diaphragm. December 1, '06, decided general improvement since injection, as shown by gain in weight and strength. Sinus still discharging but much less in quantity.

Report June, 1907. After eight months of treatment (with omission of two months when innoculations were discontinued because of excellent condition of patient and persistent high index — see chart) the sinus closed in December, and remained so until May 5th, when after a few days of temperature again there was a considerable discharge of pus. This has again practically ceased. Patient has worn a brace from May, '05, to May, '07, and was then pronounced "cured" by Dr. Porter. Improvement in general strength and increase in weight has been steady. Able to work in laboratory eight hours a day.

Fig. 6. Miss B. Age 30. Osteitis of tarsal and metatarsal bones of right foot. Resection of diseased bone. Drainage. Healed by granulation. Vaccine injections begun before operation and continued to January 25th.

June 1st. Still limps and uses cane. Wears plate in shoe. "Back at work for last six weeks; but very little pain."

This chart is given to illustrate the fact that the patient had before innoculation a persistent low index to tubercle bacillus, while there has been found after very careful and complete examinations no definite evidence of tubercular infection. Pathological slides of bone fragments removed showed simply a rarefying osteitis with no other evidence of tuberculosis. No estimations of the bovine tuberculo-opsonic index were made.

Fig. 7. Mrs. S. Age 33. Tuberculosis of left kidney and ureter — nephrectomy, ureterectomy, vesical tuberculosis and vesicovaginal drainage right pyelitis — nephrotomy. Finally drainage of right ureter through right loin. Each of these operations had an interval of rest and recovery of a year to a year and a half. Extremely critical condition when injections were begun in September, 1906, as shown by marked emaciation, large sacral decubitus, toxic neuritis of lower extremities, etc. Hope of recovery was abandoned. Soon after injections were begun improvement was noted and after remaining in hospital some seven months she has returned home in the following present condition: Great gain in weight, color excellent and general strength steadily increasing; up in chair seven to nine hours a day, walking a few steps daily. Right kidney drained by tube; old persistent fistula to left ureteral region still discharging considerable pus. Temperature normal. In this case not only the tuberculin was used, but also vaccines of colon bacillus and staphylococcus, both of which organisms were isolated from the fistulæ. (See chart.)

There seems to be no doubt that in this case a life was saved by use of the vaccines.

Fig. 8. Miss S. Age 18. Referred by Drs. Besley and Shattuck, Feb. 15, 1907. Lumbar Pott's; marked kyphosis eight years standing; large psoas abscess, right inguinal region, unbroken. Pain severe at night. Loss of weight during the last year. Temperature 99.8, pulse 100. Moderate emaciation.

Treatment has been aspiration of abscess once. Feb. 18, vaccine therapy as per chart. March 23, general condition, good; no increase in swelling; pain persistent. Temperature normal.

April 12. Maximum P. M. temperature, 99.4. General condition a little better; pain less.

June 15. General condition not as good. More pain; abscess tense. Temperature P. M., 100.6. "In general there seems to be change for the worse since April 22d."

As far as can be judged to-day what improvement there has intermittently been could as well be due to rest and diet and general hygiene as to the tuberculin.

Fig. 9. Baby G. Age 4 years. Condition, October 9, 1906, when he first came under observation: "Patient a thin, emaciated, fretful child, carried by parents because unable to walk. Thighs held flexed, but can be nearly extended passively by using some force. Has a rather sharp kyphosis involving eleventh and twelfth dorsal and first, second and third lumbar vertebræ. One sinus in the

Fig. 5 (continued).

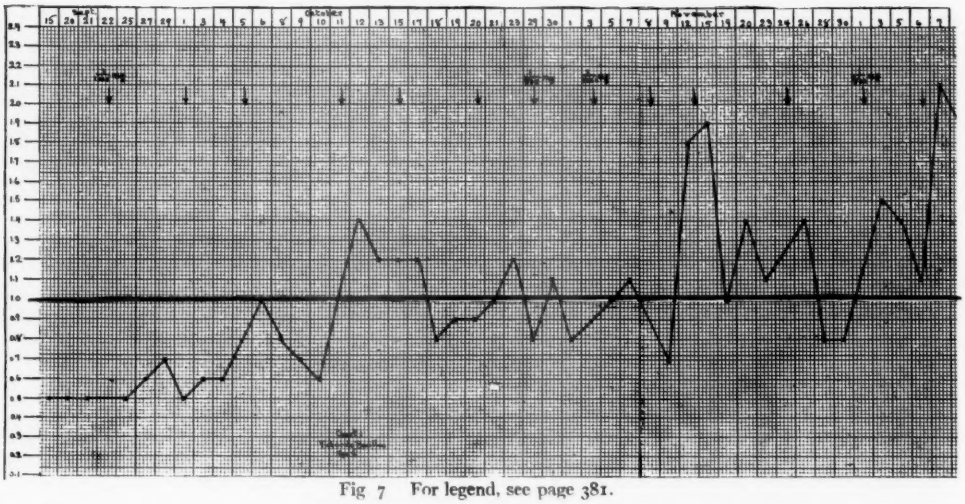


Fig 7 For legend, see page 381.

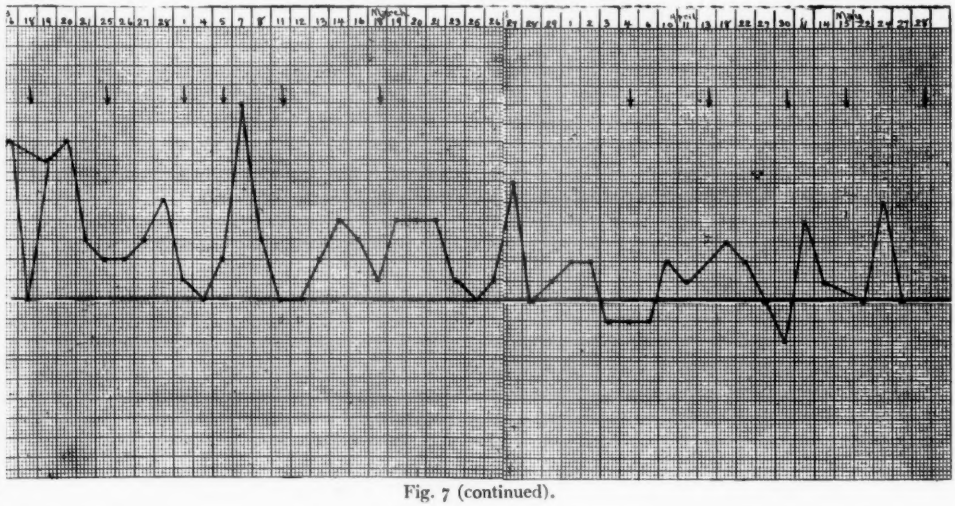


Fig. 7 (continued).

left flank and one in the left groin, both open and discharging thick pus freely. Parents said he had walked up to within three weeks, and seemed to stop because of general weakness and increasing flexion of the thighs. Patient was sent at once to St. Luke's hospital, put in bed, with slight traction on the head, and turned over to Dr. Hollister for laboratory treatment. Condition November 13, 1906: Patient has gained some five or six pounds, and now looks plump, eats well, and is cheerful, and would be out of bed running around the ward if it were not for the restraint. The sinus in the groin has entirely closed up, and the one in the flank discharges a few drops of serous fluid each day. The flexion contractures of the thigh have entirely disappeared; the patient sits up and turns over in bed with perfect comfort; the muscular spasm and rigidity have disappeared, except in the area affected by the disease." (Dr. J. L. Porter.)

Condition June 1, 1907.

May 30, '07. Dr. Sexton writes from Streator, Illinois, to Dr. Porter: "The father reports that the sinuses have both closed and that the boy is doing fine."

Fig. 10. Miss S. Old tuberculous arthritis right knee.

This case has been treated both by the vaccine and by regular applications of passive hyperemia, as secured by the use of the large glass and rubber cylinder apparatus of Bier model. The case illustrates the value of combining both methods of treatment.

Dr. Porter says: "Undoubtedly the rapidity of improve-

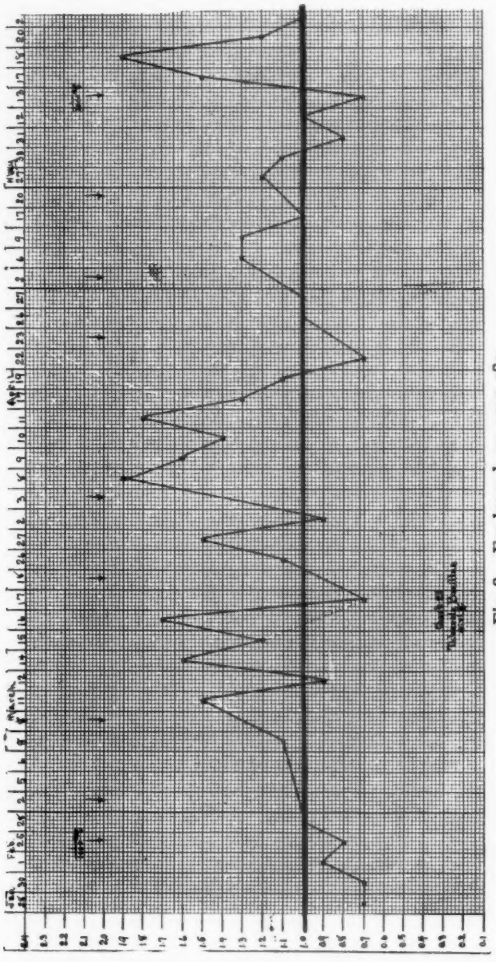


Fig. 8. For legend, see page 381.

ment has been due to either the passive hyperemia or vaccine, or both." The patient has no doubt of the results.

Fig. 11. W. Age 4½ years. Tuberculous glands of neck.

Jan. 2, 1907. Began two and one-half years ago following coryza. Ulcer broken down, became larger during this last winter. No pain, little tenderness.

Examination: Nervous, slender and rather ill nourished. Soft swelling size of hickory nut opposite angle of jaw, slightly reddened; several pea-sized glands posterior border of sterno-cleido-mastoid, non-fluctuating; one or two near anterior border of S. C. M. Opsonic index found low and given injections; went out of town for a week and larger mass found much inflamed upon return. The following treatment was then instituted:

1. Mere puncture of the broken down mass.
2. Daily use of a Bier's cupping apparatus; later at longer intervals. This was applied some 18 times.

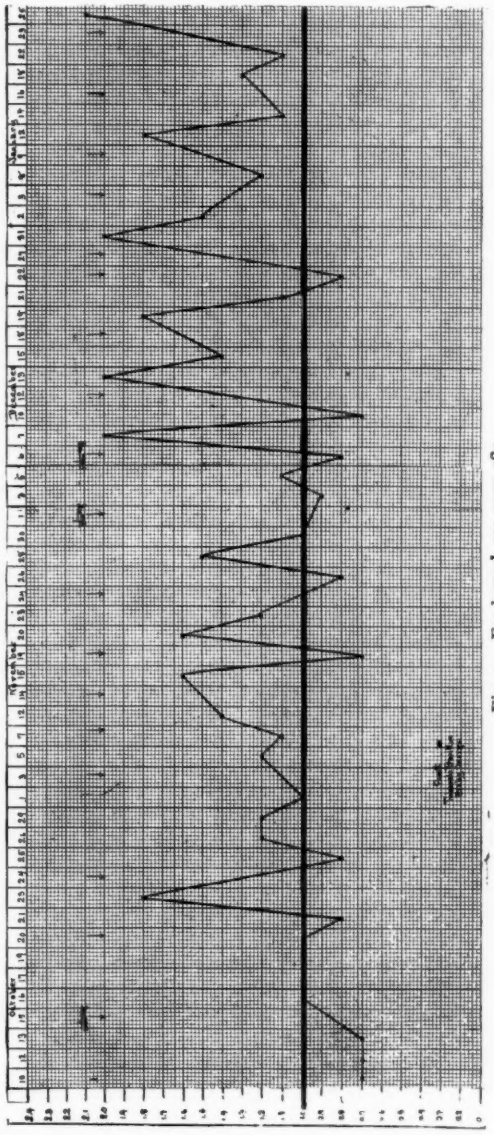


Fig. 9. For legend, see page 381.

3. Usual hygiene and cod liver oil.
4. Continual vaccine therapy, guided by the opsonic index.

The following has been the result:

June 1st. General condition of the child markedly improved. Increase in weight steady; appetite continues to be excellent, color now good, plays all day long, no temperature.

The one gland that was incised (and later curetted under

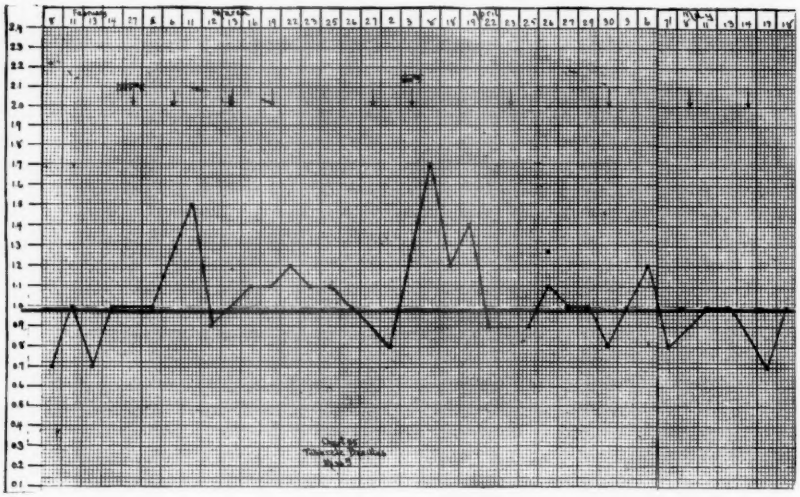


Fig. 10. For legend, see page 382.

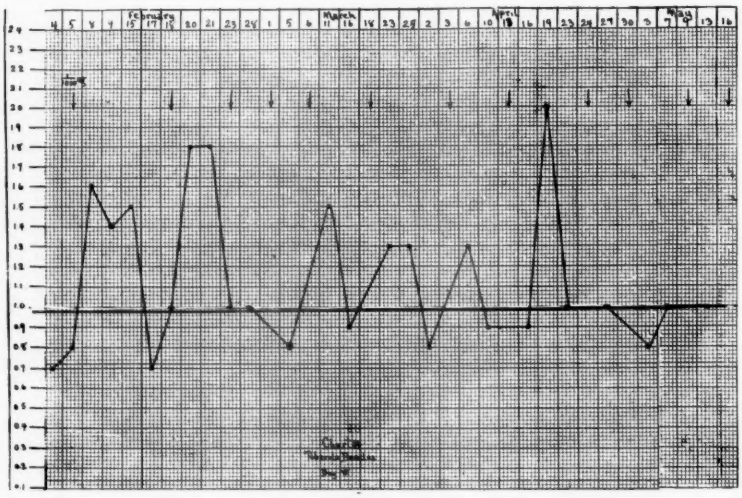


Fig 11. For legend, see page 383.

a gas anesthesia of two minutes' duration to remove the persistant sac) has completely ceased discharging. There is no scar except a single punctate bluish depression. The other glands have grown steadily smaller and some have disappeared.

Attention is again called to the evident advisability of combining passive hyperemia and vaccine therapy with an aim of lessening the extent of necessary surgical intervention.

Fig. 12. Master G. Age 6½ years. Tuberculous glands of neck.

Jan. 24th. Began two months ago on right side, two small glands posterior mastoid muscle opposite angle of jaw. Large mass from angle of jaw to within two or three cm. of symphysis, semi-fluctuating; anterior to sterno-cleido-mastoid two pea-sized nodules. On left side, cluster of pea-sized nodules anterior to S. C. M., opposite and under angle of jaw. Smaller nodules posterior to muscle. General condition only fair. Papulo-pustular eruption over cheek and nose, and neck. Adenectomy 2½ years ago. Maternal uncle had "tuberculous glands of neck."

May 10th, condition: Much improved, as noted by

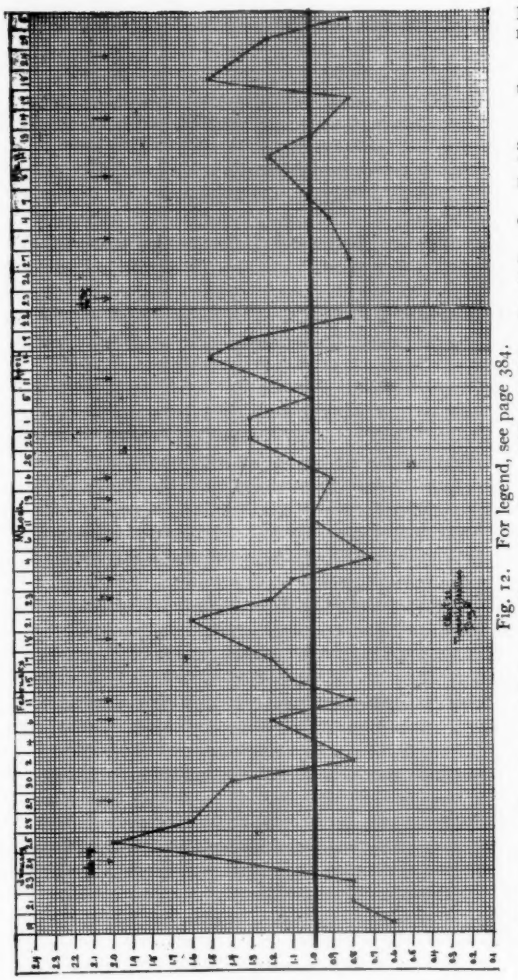


Fig. 12. For legend, see page 384.

parents, as well as examination. Steady gain in weight and strength, color much better. "Plays long and actively." All the smaller clusters of glands have become smaller and harder, some have disappeared. The large mass on right side is much smaller and more firm. No tendency to break down is noted.

Fig. 13. Mr. F. Age 56. Primary synovial tuberculosis right elbow one and a half years' standing, requiring arthrectomy April, 1906. Tenderness and edema, fistula persisting six months. Since injections have been made the sinuses have closed over, and the patient expresses himself as very much better.

Condition May 15th, having been under vaccine treatment since October. Fistulæ have remained closed. Ability to use arm has remained about stationary during last few months. Still some pain at infrequent intervals. Is able to play violin fairly well. "A very satisfactory result for such a condition." (McArthur.)

Fig. 14. W. P. Age 3 years. Pott's disease.

Jan. 23, 1903. Kyphosis noticed for about a month, tenth dorsal. Whole spine rigid.

Jan. 19, 1906. Large psoas abscess on right side.

Dec. 14, 1906. Pale and thin, large abdomen. One sinus discharging slightly. General condition not good. "About an even chance of living without vaccine treatment." Dr. Ridlon.

March 1, 1907. General condition better, looks better, evening temperature lower.

May 15, 1907. Total gain 5 lbs. 8 oz. Looks well, abscess discharging moderately. Temperature practically normal.

Fig. 15. J. B. Age 8 years. May 2, 1906. Pott's disease and hip disease. Father died of tuberculosis.

December 14, 1906. Abscess containing three or four ounces on outer side of thigh, apparently coming from hip. Skin thin, likely to rupture in two weeks. Hip has been sensitive to movement, but no longer so. Pott's kyphosis small. No evidence of abscess from it, good flesh; good color; ought to do well without vaccine treatment." Dr. Ridlon.

March 1, 1907. Looks well, has gained 2 lbs.

April 5, 1907. Another abscess forming on thigh above sinus.

May 15, 1907. Gain total 3 lbs. 11 oz. No material change since last date. Improvement in color and flesh.

Fig. 16. W. B. Age 3 years. Hip disease.

Nov. 17, 1905. Has limped for ten months following fall from table. Has been treated at County Hospital for about six months.

Nov. 28, 1906. Disease has appeared in right shoulder.

Dec. 14, 1906. Fair flesh, but rather pale. Hip doing well. Shoulder swollen and held rigid, and likely to have abscess and result in a stiff joint after two or more years. "Hip likely to do well without vaccine." Dr. Ridlon.

Dec. 21, 1906. Hip abscess broke.

March 1, 1907. Abscess in front of shoulder. Joint has more motion; arm has been in sling. Hip doing well.

May 15. Total gain 1 lb. 11 oz. Shoulder is stiffer and abscess larger. Abscess in hip larger.

Fig. 17. R. R. Age 7 years. Pott's disease.

June 22, 1906. Double psoas contraction and abscess can be made out on right side.

December 14, 1906. Rather pale and thin. "No immediate result expected without vaccine treatment. It is hoped the vaccine will cause small abscess to disappear." Dr. Ridlon.

March 1, 1907. Psoas contraction on both sides; abscess on right, color good. No increase in weight.

May 15, 1907. Total gain in weight 1 lb. 5 oz. Abscess on inner side left thigh. Psoas contraction on right side. Looks fairly well.

Fig. 18. M. O. Age 13 years. Hip disease.

October 25, 1906. Hip disease for 11 years. Five sinuses for a long time; does not know how long. Joint rigid.

December 14, 1906. Is pale and waxy. Abdomen large; four sinuses. Flexion deformity 90 degrees. No sensitiveness. "Has about 60 per cent probability of growing worse, succumbing in nine to twelve months from waxy liver and kidneys." Dr. Ridlon.

March 1, 1907. Looks better, face fuller. Less discharge with less offensive odor.

May 15, 1907. Gain in weight since January, 22 oz. No change in the condition of the discharge. Improvement in color and flesh.

Fig. 19. Mr. F. Age 45 years.

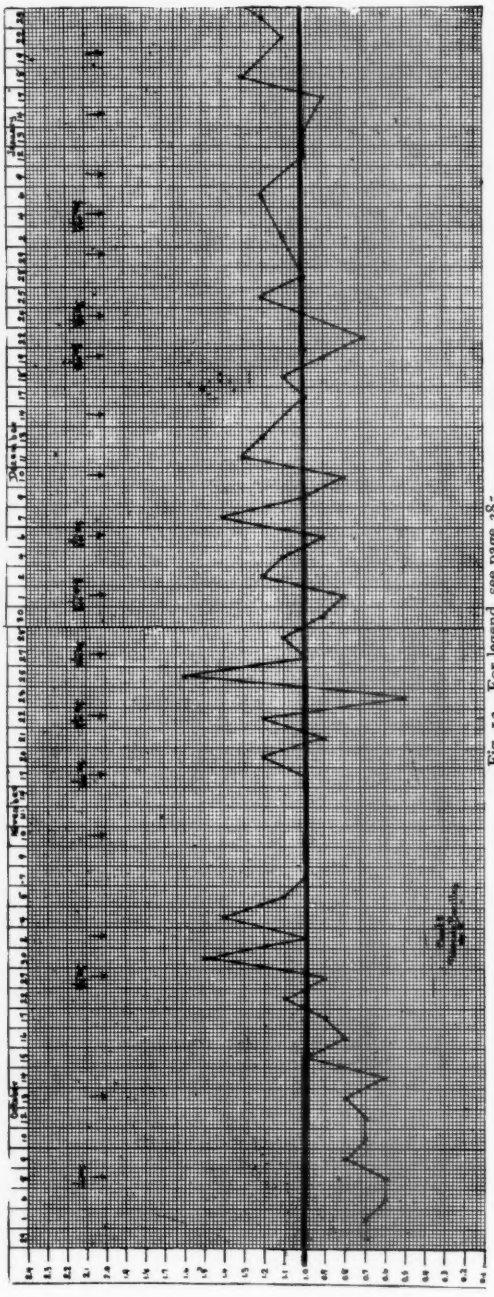


Fig. 13. For legend, see page 385.

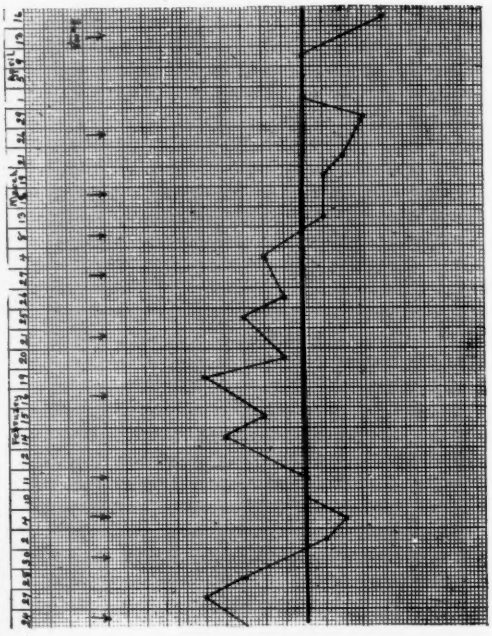


Fig. 13 (continued).

"Some years ago he began to have pains all over his body, and five years ago he had to give up his work as boiler maker. About four years ago he developed disease in one ankle and later on came under my care. I treated him with a plaster splint, and full doses of mercury and iodide of potash and the ankle promptly recovered; more promptly than I would have expected a purely tubercular ankle. After two years he developed disease in the other ankle. Each ankle-joint disease being subsequent to a slight traumatism and recently he has suffered disease in the knee of the same side. These conditions, together with the fact that he has some tabetic symptoms, leads me to believe that the important factor in his case is syphilis. His tuberculo-opsonic index is characteristic of tuberculosis, as is that of one of the children who has multiple joint disease which I believe to be due to inherited syphilis. It appears to me to be reasonably conclusive that the so-called syphilitic joint disease which clinically cannot be told from tubercular joint disease, is really tubercular joint disease occurring in a patient whose resistance to tubercular infection has been weakened by syphilis and whose resistance may be increased by anti-syphilitic treatment." John Ridlon.

May 15th. Patient reports he is much improved. Came to the laboratory using a cane instead of crutches.

Fig. 20. B. B. Age 2½ years. This case is reported because of its bearing upon diagnosis.

Admitted May 12, 1904, for rachitic knock knee.

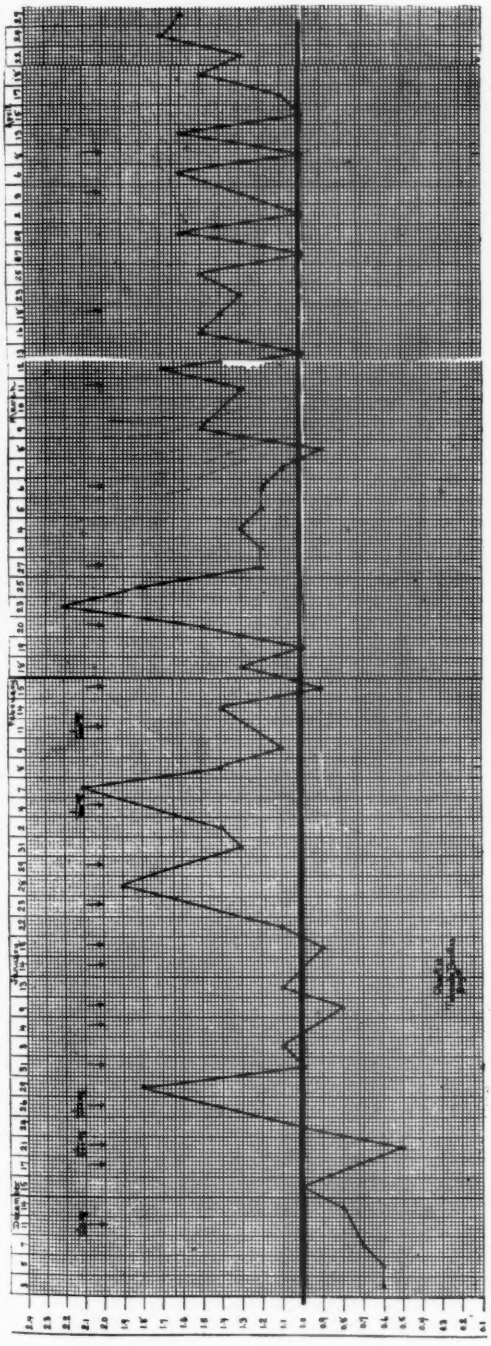
June 9, 1904. Osteoclysis above knee by Dr. Blanchard, and leg straightened.

July 12. Fell and hurt knee. Joint swollen. Cast applied.

November 29, 1904. Knee stiff, but no swelling.

November 24. Ether, knee manipulated, cast applied.

August 11, 1905. Allowed to walk. No pain.



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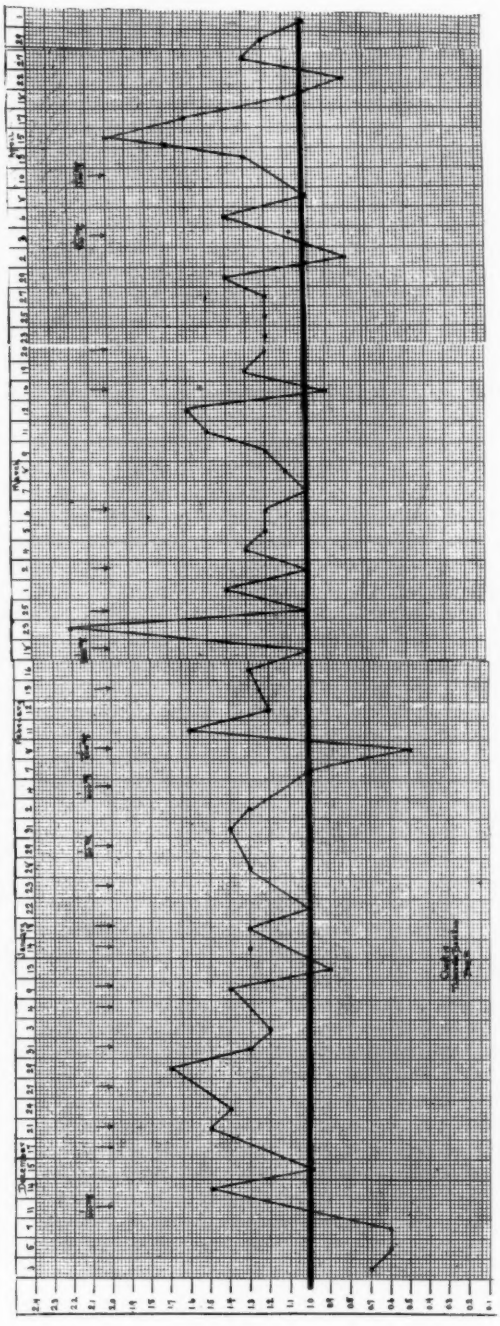
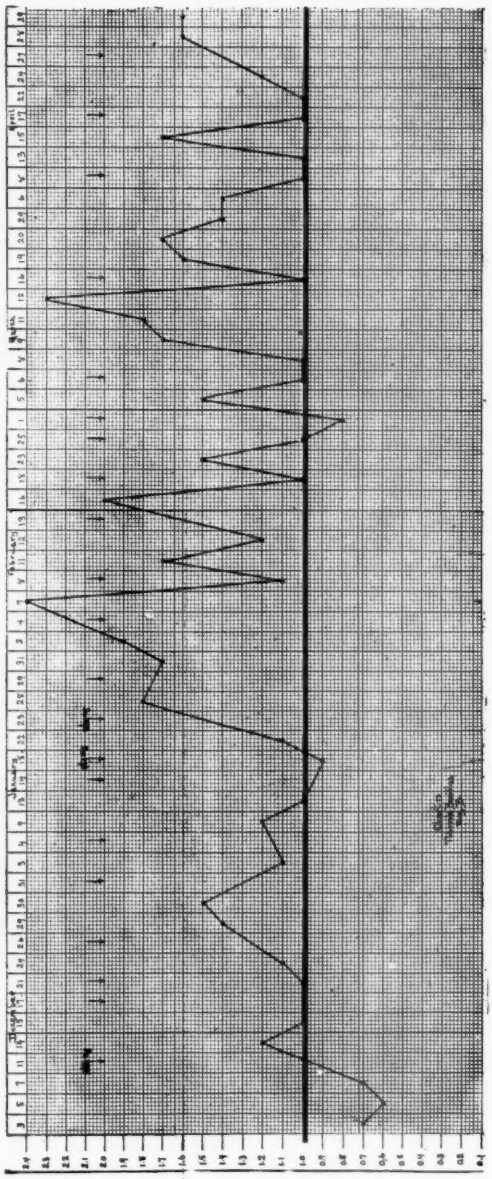


Fig. 15. For legend see page 385.

Fig. 13 (continued).



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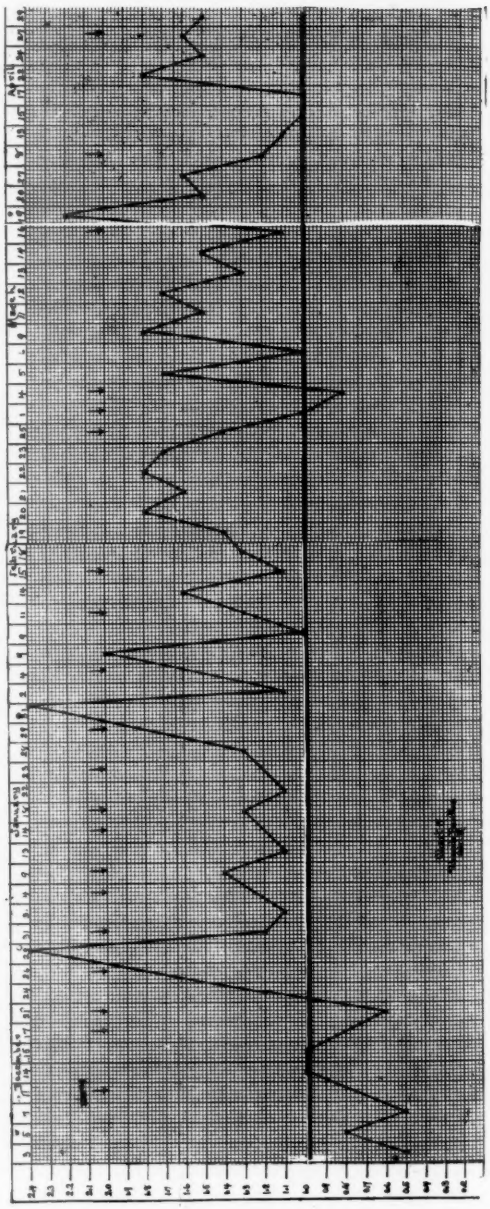


Fig. 17. For legend, see page 385.

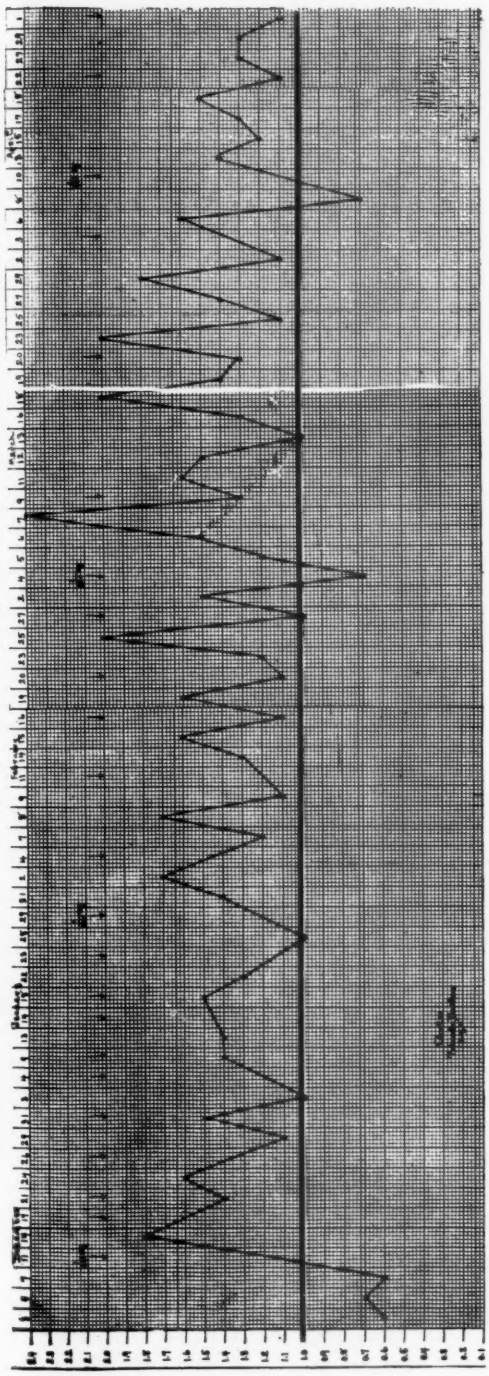


Fig. 17. For legend, see page 385.

August 31. Knee 3.4 in. larger.

November 21, 1906. Fell from bed and hurt knee. Joint swollen. Temperature 102.

December 3, 1906. Cast applied. Has great pain, temperature 104.

December 14. Several blood examinations have been made to determine if possible if joint is tuberculous. See chart. Abscess formed in popliteal space; opened; a second one on inner condyle formed.

March 6, 1907. Sent to Dr. Hollister at St. Luke's for operation.

The entire synovial membrane was removed, as found to be typically tuberculous. Primary union secured and patient is now in cast with normal temperature. General condition good. Much increase in weight since operation.

Fig. 21. E. K. Age 4½ years. Hip disease.

September 7, 1907. Has complained of hip about eight months. Flexion and adduction deformity. Muscular atrophy.

December 14, 1906. Joint sensitive; night cries. Fullness in front of joint as from abscess. Condition good, "vaccine treatment in hope of absorbing abscess." Dr. Ridlon.

March 1, 1907. Abscess has increased rapidly. Still has night cries.

April 17. Abscess broke.

May 15, 1907. Total gain 2 lbs. 12 oz. Sinus nearly closed. Looks well. No longer hip deformity. Still in bed.

Fig. 22. F. L. Age 12 years. June 30, 1904. Sinus in back from abscess opened and drained. Special curvature to opposite side. No knuckle. Question as to whether abscess comes from pleural cavity or from spinal caries.

May 15, 1907. Total gain 3 pounds. Discharge about the same. Spinal deformity increasing.

Fig. 23. S. G. Age 14 years. Hip disease.

December 12, 1906. Has had hip disease for eight years. First abscess four years ago; opened spontaneously and closed. Second abscess formed six months ago and was opened. Third abscess broke two weeks ago. Leg 2½ inch shortening. "General condition good; plump and of good color. Admitted to take vaccine treatment in hope of rapidly closing sinuses." Dr. Ridlon.

March 1, 1907. Good condition, less discharge.

May 15, 1907. Total gain 3 pounds 12 ounces. Second abscess nearly closed, other discharging about same. General condition excellent.

Fig. 24. Robert S. Age 10 years. Hip disease.

Nov. 16, 1906. Nine months ago, chill and fever, lasting a week, followed by swollen ankle, and abscess after three months. Ankle healed and gave no trouble; later on pain in hip and knee.

Dec. 14, 1906. Question as to inherited syphilis. On mixed treatment, no abscess made out, general condition good. "Ought to recover in eighteen or twenty months without deformity and with some motion, without vaccine," Dr. Ridlon.

March 1, 1907. Flexion deformity of hip 35 deg., adduction 15 deg. Abscess developing on outer side of thigh.

May 15, 1907. Total gain, 3 lbs. General condition very good. Fullness about the hip. Abscess suspected.

Fig. 25. Colon bacillus. Dr. M. "Three years ago considerable quantity of pus was found in my urine. A year and a half later a stone was removed from my right ureter. The kidney was not examined and no external drainage provided for; and pus did not decrease in amount. One year after the operation the quantity of pus was considerably increased, amounting sometimes to 12 per cent of the urine. At this time there was great lack of strength

Fig. 18. For legend, see page 385.

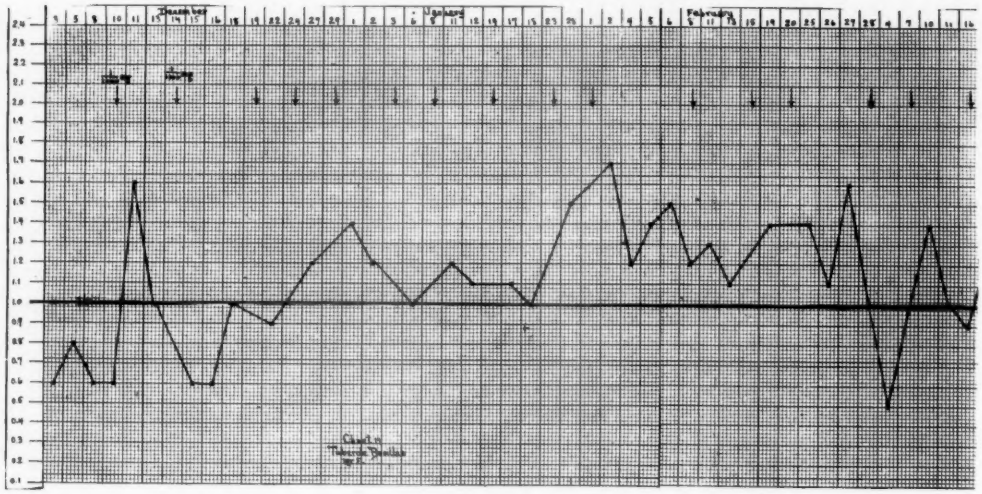


Fig. 19. For legend, see page 385.

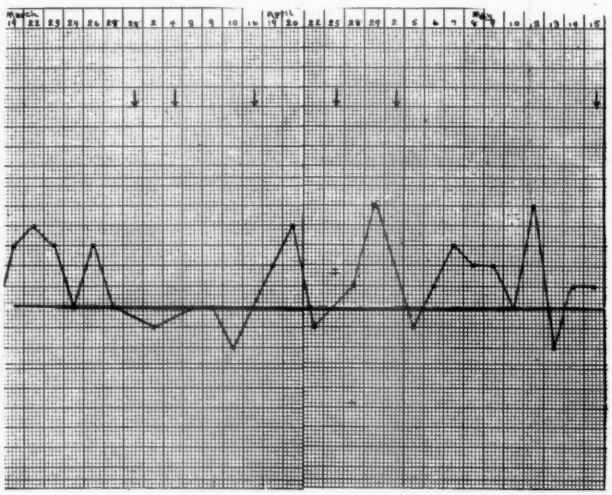


Fig. 19 (continued).

and exhaustion and sometimes collapse would follow physical exertion. In the Spring months under opsonic treatment the pus gradually diminished until late in May a laboratory examination showed .1 per cent, and for the past few weeks there has been a notable increase in strength. Urotropin in daily doses of 15 grains has been used throughout the illness."

Although the improvment, checked up as it has been by Dr. Arthur Elliott (see below), seems very definite both as to the general strength and local urine findings, one must consider the possibility of the presence of a kidney stone and a quiescent period.

Fig. 26. H. G. Age 51. (Colon bacillus.) "Since 1900 vesical irritability due to chronic prostatitis and inflammation of the left seminal vesicle. No cystitis until the end of 1903. The urine mostly clear, was turbid at times and at such times contained the colon bacillus and scant staphylococci. Distinct, though moderate, benefit from massage, but no permanent results from other local treatment by a competent surgeon. On the last of Feb-

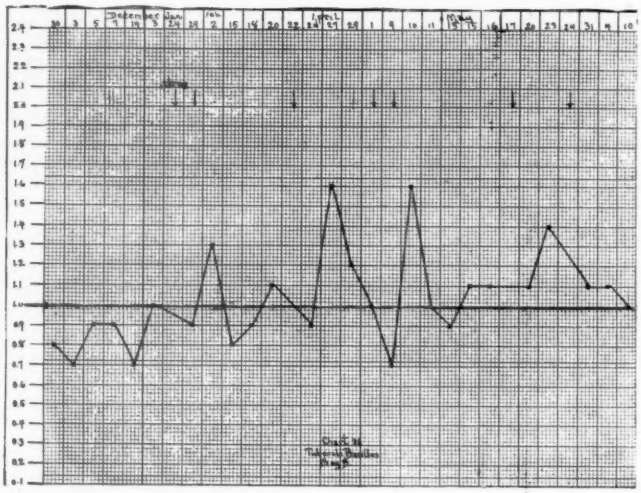


Fig. 20. For legend, see page 386.

ruary, 1904, hematuria led to the detection of a minute epithelioma of the bladder complicated by cystitis. Removal of a walnut-sized epitheliomatous tumor with partial resection of the bladder by the late Prof. Nitze in August, 1904. On account of hemorrhage neither the bladder wound nor the abdominal incision were sutured. After about three months the wound had closed except for a fistula which closed finally in June, 1905. Meanwhile, a post-operative hernia had developed. The cystitis improved under irrigation while the wound was open.

Subsequently it diminished steadily without further treatment. In February, 1907, there was only moderate vesical irritability (occasionally worse in a spell of a few days), but considerable distress, presumably due to the hernia and perhaps adhesions. The cystoscope showed a normal bladder inflamed only at the neck. Capacity, 150 to 180 c. c., urine almost perfect at times, but occasionally turbid.

Feb. '07. Culture gives abundant growth of colon bacillus. The urine cleared materially within a few days after the first injection and is on the whole much oftener normal than during the last few months prior to the treatment, but still is moderately turbid off and on. Both pus-cells and bacilli are much reduced in number; there is a marked improvement in the vesical irritability, but no change in the distress referable to the hernia."

Fig. 27. Staphylococcus. Mr. G. About 17.

April 26th. Acute furunculosis and cellulitis, arm. Three days' standing. Staphylococcus isolated. Two furuncles on left arm. Arm much inflamed and swollen. The two furuncles were incised and a wet boric dressing applied for two days.

May 6th. Much improvement. Cellulitis disappeared. Furuncles clearing up.

May 10th. Dry scab on both furuncles. No inflammation.

This case seemed to recover very quickly for so marked an infection, but no definite conclusions can be drawn, as other treatment (wet dressings, etc.) was also carried out.

Fig. 28. Staphylococcus. Age 39.

May 20, 1907. Referred by St. Luke's Dispensary. For two years has had dry scaly eczema of left forearm which never spread much until recently. At present entire forearm is involved. Two weeks ago several boils appeared and at present there are six in the pustular stage, with innumerable small pustules between. First injection May 22nd. May 24 furuncles dried up, but itching excessive. May 28 and June 8 respectively, two new lesions appeared, smaller in size, and healing in two days' time. Eczema reduced in one small area.

Fig. 29. Staphylococcus. Mr. E. Age 20.

March 20th. Has had acne about four years. Local treatment two years ago. Helped until discontinued. Complexion muddy. About eight red pimples over bearded region. Fused, indurated, reddened blotch on right cheek. Few pustules, several on back, one on chest.

May 16th. Says face is not so hard to the touch. Less induration and redness. No pustules, but innumerable papules.

May 29th. Face greatly improved. Papules very small and less in number. Thinks himself there is noticeable improvement.

Fig. 30. Staphylococcus. Mr. C. Age 40. Referred by Dr. Hugh Montgomery.

Scrotal eczema for years, with localized furunculosis starting last September. Former treatment local applications and diet, with result that boils would appear in crops, then one or two. Not free longer than ten days. General condition only fair. Autogenous vaccine given.

April 8th. Boil developed, but did not break down as former ones had done. Disappeared in five days.

April 29th. Boil appeared and discharged slightly.

May 24th. No furuncles since above. Considers himself much improved. Only two have appeared since injections began.

June 18th. No furuncles since April 29th.

Fig. 31. Staphylococcus. Miss S.

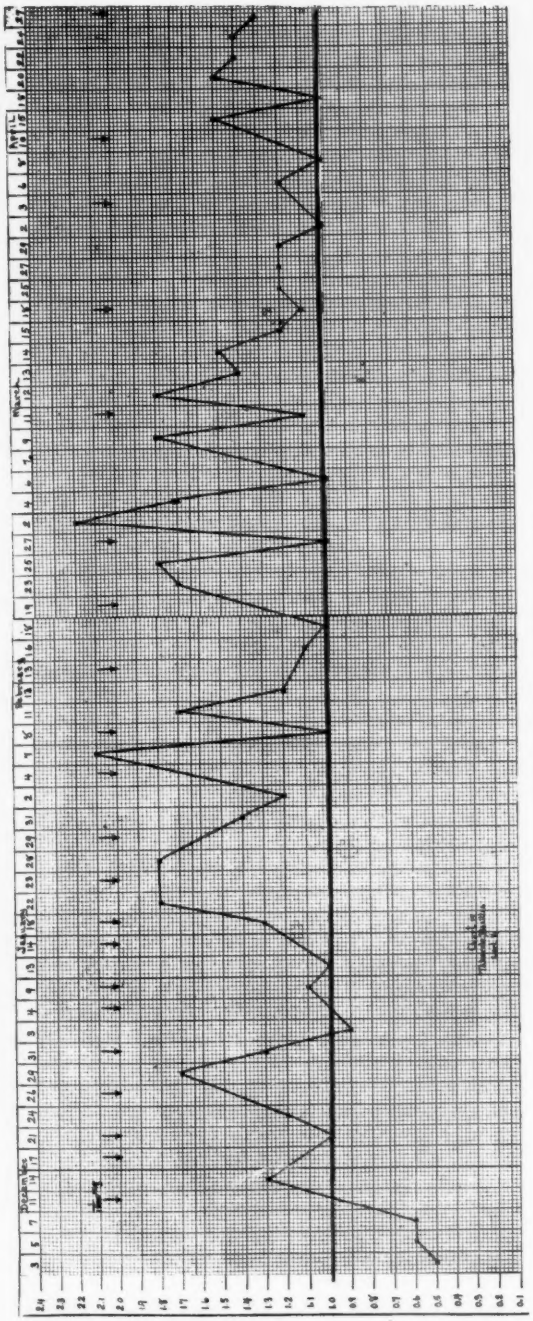


Fig. 21. For legend, see page 389.

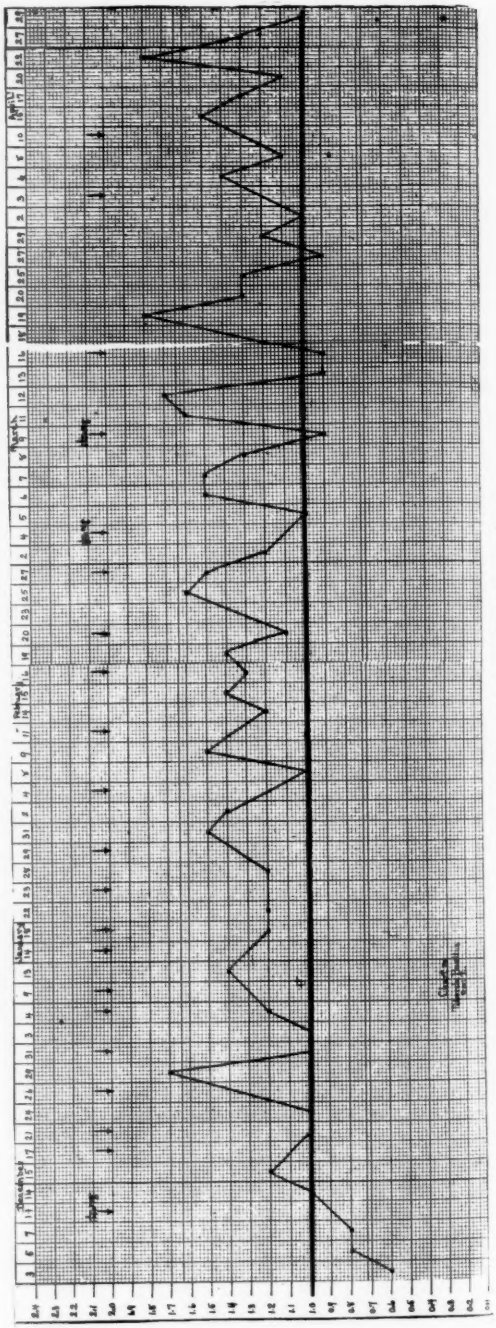


Fig. 22. For legend, see page 389.

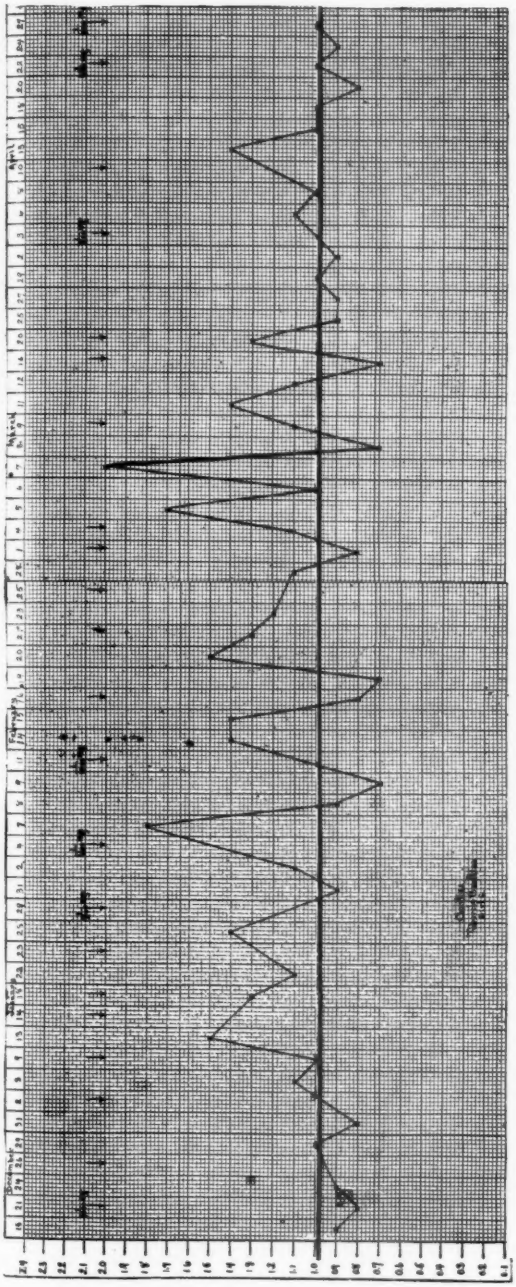


Fig. 23. For legend, see page 389.

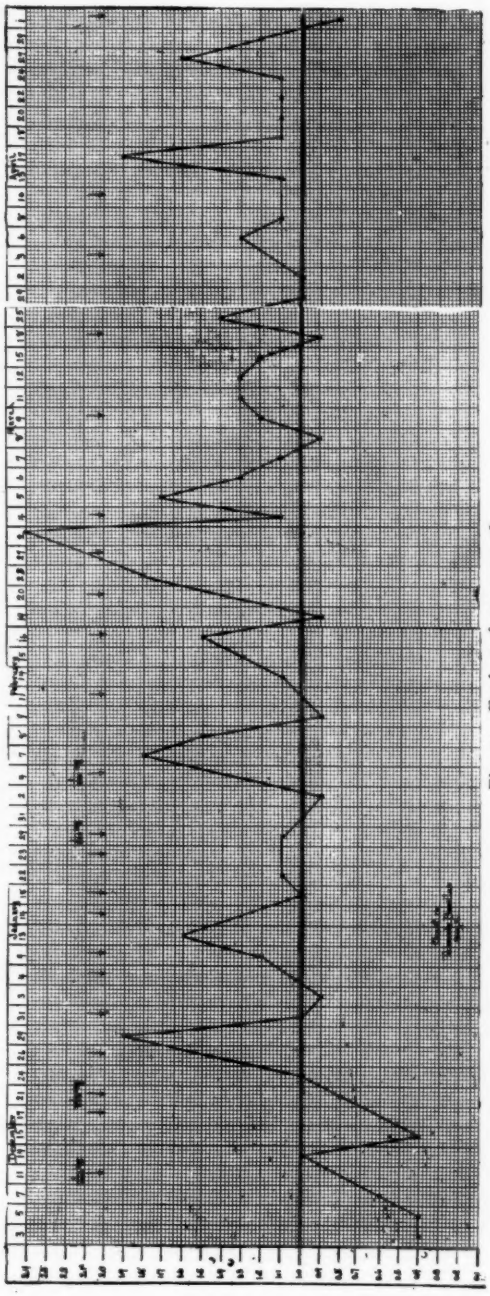


Fig. 24. For legend, see page 389.

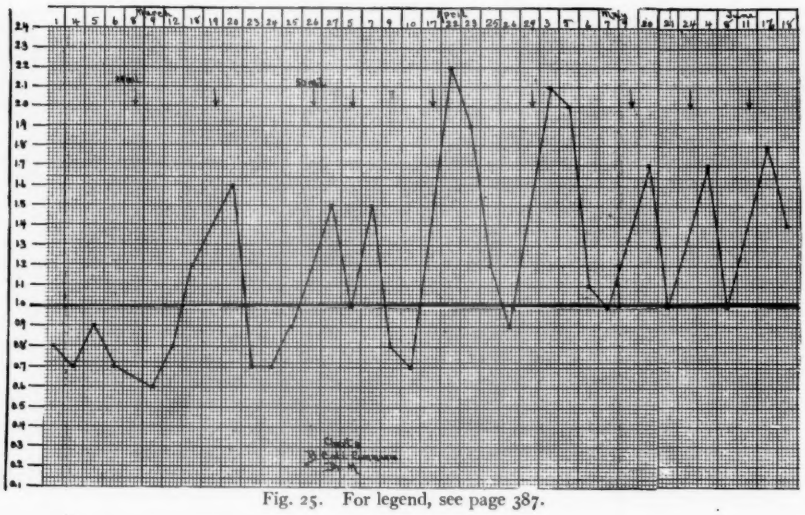


Fig. 25. For legend, see page 387.

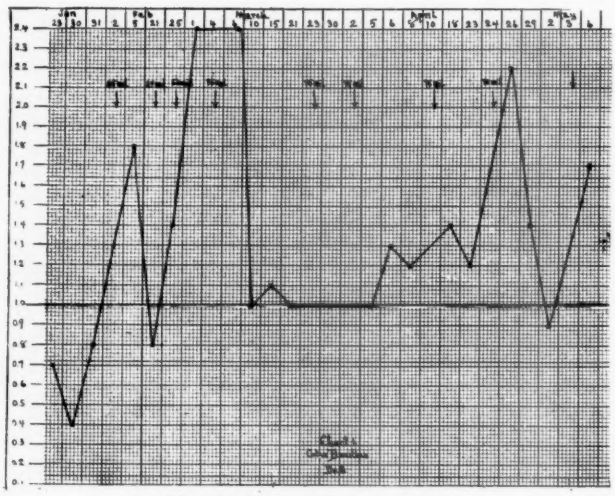


Fig. 26. For legend, see page 390.

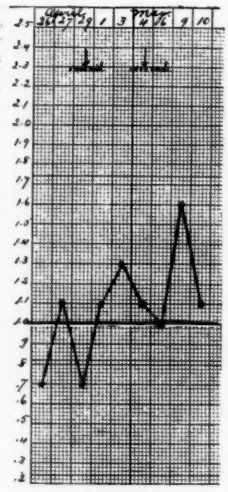


Fig. 27. For legend, see page 391.

Chronic facial acne of twenty years standing. Many different treatments. Some improvement during last few years. Otherwise in fair health.

February 27, '07. Examination showed about fifteen papules with two or three pustules. General leathery feel to skin of face. Vaccine treatment begun.

March 13. Face improved; lesions on chin only. General health better.

April 30. A number of new pustules.

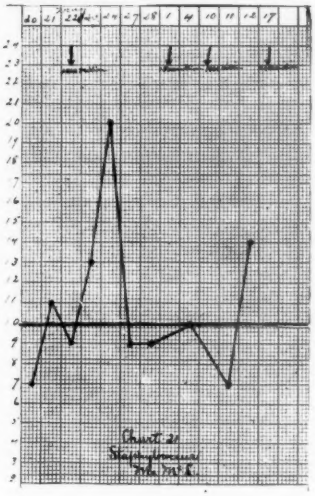
May 15. Three papules only. Skin softer.

May 28. One papule on cheek. Two on chin. Forehead clear.

Considers it a positive sign of improvement that eruption is being checked. No other treatment except diet and hygiene.

June 18. No pustules for four weeks. No papules for two weeks. Skin smooth and clear and "does not break out as it formerly did when I eat candy, etc."

showed characteristic tuberculo-opsonic index, which may be interpreted to mean that the so-called syphilitic joint-disease is really tubercular joint-disease in a patient whose resistance has been weakened by the luetic condition. In



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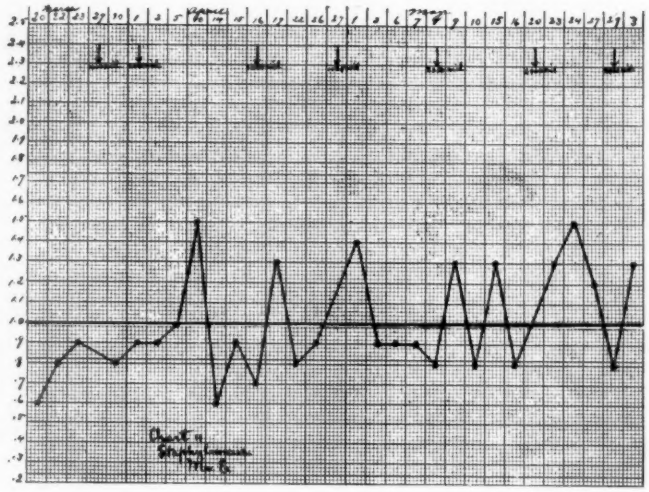


Fig. 29. For legend, see page 391.

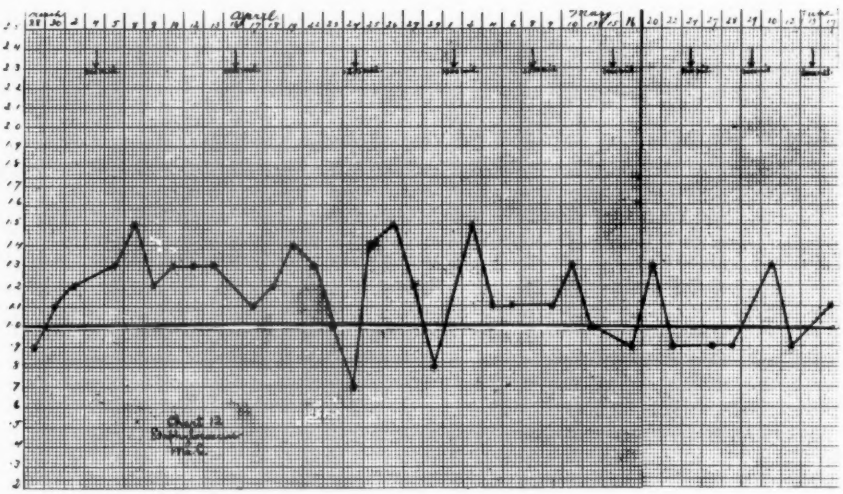


Fig. 30. For legend, see page 391.

a patient in good physical condition having a recently developed joint-disease, clinically tuberculous, the variation of the opsonic index from the normal is not sufficient to make the diagnosis conclusive." JOHN RIDLON.

*II. General Clinical Conclusions*

As to the value of vaccine therapy we may say:

(a) It is of distinct value in the treatment of chronic localized tuberculosis of the bones, joints, glands, and urinary tract, acting not

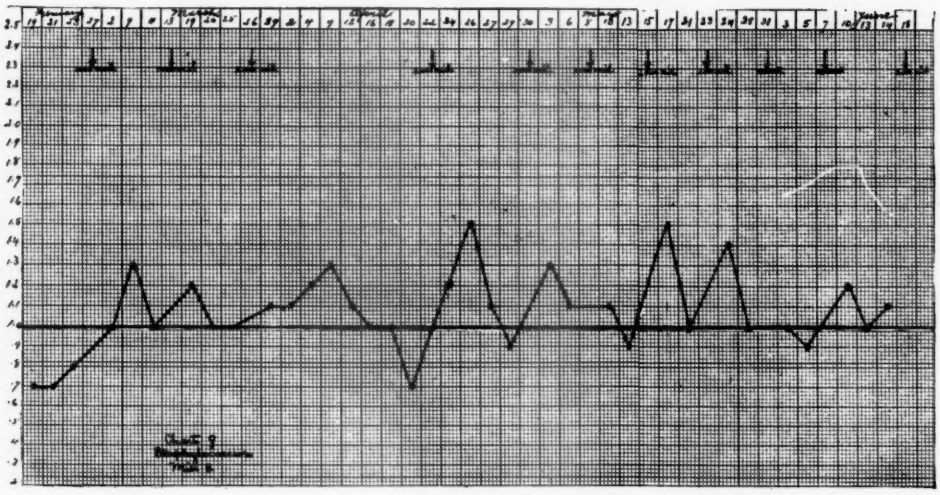


Fig. 31. For legend, see page 301.

only as a general tonic, but as a local stimulant to repair of tissues;

(b) It is of marked value in the treatment of staphylococcus affections, such as acne, furunculosis, etc. (we do not report a large number of such cases, but clinical improvement has been universal in all cases we have treated);

(c) It seems to be of definite value in the treatment of urinary tract infections by the colon bacillus.

### *III. Cases of Gonorrhea*

About twenty-five cases of acute and chronic urethritis with and without complications have received injections of vaccine from our laboratory during the last few months. Most of the cases have been in the service of Dr. L. E. Schmidt at Alexian Brothers' Hospital. Before publishing clinical data, it was planned to treat different series of cases with both the usual methods plus the vaccine and then like series with the vaccine alone. No cases have as yet been treated by vaccine alone. As soon as this is done, full conclusions will be published. In general we can say from our own experience:

1. The laboratory technic is difficult, but when carefully carried out very exact data are obtained;

2. The outlook for the value of vaccine therapy in gonorrhea infections seems excellent.

For full laboratory data, covering technic, charts, etc., I refer to Dr. Vail's portion of this paper.

### *IV. Table Showing Relation between Passive Hyperemia and Vaccine Therapy*

The experimental work shown in table has been carried out to see if not only the opsonic power of the general circulation could be raised, but also by the use of Bier's cupping apparatus such stronger fluid could be drawn into the *local* diseased areas. Some of the exuding fluids from the fistula or abscess was obtained before the cup was applied and its opsonic strength tested. Then the cup was intermittently applied according to the Bier method, for from $\frac{1}{2}$ to $\frac{3}{4}$ hour. Again the fluids then exuding were tested. It was found in every case that the opsonic index of the fluids of the local diseased area was lower than that of the general circulation, and by the use of a Bier's cup could be raised to that of the general circulation. (In 2 instances the counts were higher, for which we offer no explanation, being unable to ascribe it to errors in technic.)

| | Date | O. I. Of exuding fluid before Bier Treatment | O. I. Of exuding fluid after Bier Treatment | O. I. general circulation |
|---|---|---|---|---|
| Boy A. Tuberculous Sinus | Nov. 23 | 0.3 | 0.7 | 0.8 |
| | Dec. 4 | 0.6 | 1.2 | 1.4 |
| | Dec. 6 | 0.8 | 1.0 | 1.6 |
| | Dec. 10 | 0.7 | 1.2 | 0.9 |
| Boy B. Tuberculous Fistula | Jan. 28 | 0.8 | 1.5 | 1.8 |
| Boy W. Tuberculous Glands | Feb. 16 | 0.4 | | 1.5 |
| | Feb. 20 | 0.4 | 1.4 | 1.8 |
| Boy P. Tuberculous Fistula | Jan. 28 | 1.0 | 1.8 | 1.9 |
| | Apr. 2 | 0.9 | 1.1 | 1.0 |
| Boy O. Tuberculous Fistula | Jan. 28 | 1.0 | 1.2 | 1.0 |
| | Apr. 2 | 0.5 | 0.9 | 1.1 |
| Boy B. Tuberculous Fistula | Jan. 28 | 1.3 | 1.5 | 1.3 |
| | Apr. 2 | 0.6 | 1.0 | 0.8 |
| Girl G. Tuberculous Fistula | Apr. 2. | 0.5 | 1.0 | 0.9 |

We may conclude, then, that *one* reason why the use of the Bier's cup is of avail in localized diseased areas, is that the opsonic power of the fluids of such areas is raised.

The value of combining vaccine therapy by which the general opsonic index is raised with passive hyperemia by which the local index is raised should be here again emphasized.

### *V. Final Remarks*

In the future, it is planned not only to use the vaccine therapy as guided by the opsonic index as an aid to our surgical work, but also to aid phagocytosis by more systematic attempts to increase the numbers of phagocytes. The different agents will be tried, such as nucleinic acid, etc.

Among the latest reports from different American laboratories which have been working during the last year upon opsonins are found conclusions to the effect that one cannot depend upon the present day technic for accuracy in estimation of the index, etc., and that different workers equally skilled have widely varying results. We cannot agree with such conclusions. *We have found, on the contrary, that after skill has been acquired and like conditions governing findings (like fields on the film, etc.) followed, that the final results of different observers grow more and more accurate and agree with but very slight variation.* (See tables given by Drs. Lincoln, Vail and Hagans.)

*We also believe that there is a definite normal index to the different opsonins, and this lies between certain clear cut boundaries, and that if a serum is found that has a persistently varying index (after three to four examinations) from this normal, this individual's serum is* abnormal *and his abnormality is probably due to injection by the specific germ.*

Further: If there is but one of the four counts made upon alternate days that is distinctly without these boundaries, this is a strong indication of his abnormality.

I refer again to the other portions of this joint paper for tables showing our findings relative to the normal indices.

## III. LABORATORY INVESTIGATIONS

### THE OPSONIC INDEX IN GONORRHEA

By Ruth Vail, B. S., M. D.

I. The Technic used in Determining the Gonococco-Opsonic Index

II. The Normal Gonococco-Opsonic Index. A Preliminary Report of the Study of the Indices in 30 Cases of Gonorrhea

### I. The Technic Used in Determining the Gonococco-opsonic Index

The "opsonist" is confronted not only with the ordinary difficulties of the bacteriologist in growing and isolating the gonococcus, but with the tedious procedure of training the organism to qualify for a place in the opsonic laboratory. The greatest obstacle to be overcome is the persistence of this diplococcus to clump. This attribute is more pronounced in some strains than in others, but I believe that it can be largely overcome in many strains, which at first exhibit a marked stubbornness in clumping. The strain which is now used successfully in our laboratory clumped most viciously in its early generations, and it required several weeks of careful cultivation

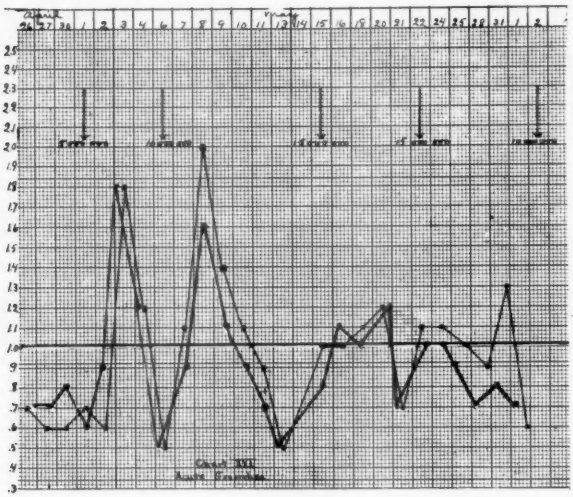


Fig. 32.

Fig. 32. [1]Patient No. 21. Entered hospital April 24, 1907. Age 24. Previous attacks, 2. Present attack, 2 weeks' duration. Acute urethritis. Complications: Prostatitis, chancroids, and suppurating inguinal adenitis right side. Sub. Syms: Pain in right inguinal region and in prepuce.

RECORD OF CASE

| | Average O. I Before Vaccine Treatment and Between Inj's. | Inj. | Sub. Syms. | Physical Findings | |
|---|---|---|---|---|---|
| | | | | Urethral Discharge | Complications |
| May 1 | 7 | 5 000.000 | Pain in right inguinal region | Profuse | Prostatitis, chancroids, suppurating inguinal adenitis right side |
| May 6 | 1.0 | 10,000.000 | | | |
| May 15 | 1.1 | 15.000.000 | | | |
| May 20 | | | | Profuse | |
| May 22 | 1.2 | 15,000,000 slt. local reaction | | | |
| May 26 | 1.0 | | | | Prostate smaller and softer. Chancroids cured |
| June 2 | 1.0 | 10 000.000 | | Slight, clear | Prostate neg. |
| June 9 | | | Absent | Absent | Slight left spermatocystitis |

[1]In the gonococcus charts the red line represents the curve of the phagocytic index and the black line the curve of the opsonic index

before it could be used with any accuracy in opsonic work. All things which tend toward the luxuriant growth of the gonococcus render it more valuable in the opsonic laboratory.

A. CULTIVATION OF THE GONOCOCCUS

The most satisfactory and easily prepared medium is ascitic or hydrocele agar. Ascitic or hydrocele fluid is first collected in sterile flasks; 2 per cent agar is rendered 1 per cent acid, tubed and sterilized.

The agar is cooled to 45 or 50 ° C. and the ascitic fluid heated to the same temperature. To each tube is added, with careful asepsis, one-half of the agar volume of ascitic fluid.

The tube is then gently agitated and slanted. It is well not to make up more than will be used in two or three weeks, as it dries out, and the organisms grow more luxuriantly in the presence of moisture. The slants, after solidifying, should be kept in a warm place for 24 or 48 hours, to be sure of their sterility.

It is well to incubate the agar till it has reached body temperature before inoculating, either with fresh pus, or from other culture tubes. This avoids the lowering of temperature which tends to slow or inhibit the growth of Neisser's diplococcus. For the same reason the inoculated tubes should be incubated as promptly as possible.

Transplantation every 12 to 48 hours is not necessary to the existence of the gonococcus, but greatly aids in maintaining its luxuriant growth, and in avoiding: (1) involution forms,

and (2) a deposition of extracellular substance, which renders it difficult to break up clumps and interferes with clear staining.

Gonococci grow well at 37½°C., but at 39° they grow larger, and the clumps are more easily broken up. The strain which we have now been using for five months persisted in growing in hopeless clumps, until cultivated at 39°C. A temperature of 45 or even 50°C. for 24 to 48 hours does no harm to an attenuated culture, if there be plenty of moisture present; but if left for that period at 20°C., they die.

### B. THE EMULSION.

Wright says that in working with the gonococcus everything should be made ready before the emulsion is prepared. I would modify this by saying that the emulsion should be thoroughly churned immediately before using.

To one tube of a 12 to 20 hours' growth on ascitic agar is added about one-half a cubic centimeter of a 1.5 per cent salt solution. (1.5 per cent is used to inhibit spontaneous phagocytosis.)

The growth is carefully removed with a platinum wire, and the resulting suspension withdrawn into a long capillary pipet. The pipet is sealed, shortened and centrifuged for 1½ to 2 minutes. The supernatant fluid is withdrawn into a short pipet. One part of this suspension and two parts of 1.5 per cent NaCl are placed in a short pipet, the bottom of which can be easily reached with a capillary tube, and this suspension is churned vigorously for 5 minutes by drawing it back and forth into another pipet. This is run through and examined to ascertain whether or not the emulsion is of a suitable strength.

A bacterial average between one and two gonococci per leucocyte is the most desirable and is usually obtained when prepared in the above described manner. With an average of 3 or 4 per leucocyte, there is likely to be clumping. Below .8 a slight error in counting is much more appreciable in the index. The emulsion, if kept in the refrigerator, is perfectly usable on the following day, thorough churning having been repeated just before using. On the third day it is difficult to break up the clumps.

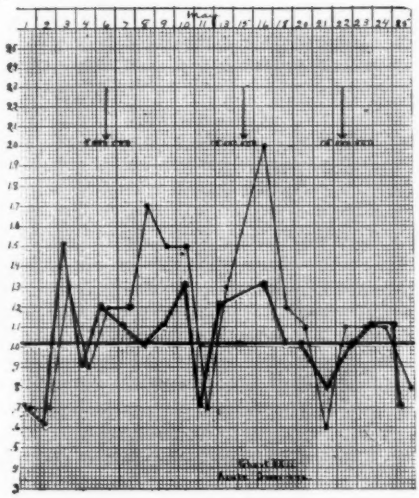


Fig. 33. Patient No. 22. Entered hospital April 30, 1907. Age 27. Previous attacks, 1, 5 years ago, 1 month's duration. Present attack, 2 weeks' duration. Acute urethritis. Complications: Prostatitis —seminal vesiculitis. Left epididymitis. Sub. Syms: Pain in right testicle.

RECORD OF CASE[1]

| | Average O. I. Before Vaccine Treatment and Between Inj's | Inj. | Sub. Syms. | Physical Findings | |
|---|---|---|---|---|---|
| | | | | Urethral Discharge | Compli-cations |
| May 6 | 1.0 | 5,000,000 | Slt. sore-ness in urethra | Profuse | Prostatitis, left seminal vesiculitis, epididymitis |
| May 15 | 1.2 | 15.000.000 | | | |
| May 22 | 1.2 | 15.000 000 | | | Improved |
| May 25 | 1.0 | | | | Left hospital |

### C. "RUNNING THROUGH"

The important difference in the technic of running through the gonococcus, from that of any other organism, is the shorter period of incubation. We have found that 7 minutes incubation, as used in Wright's laboratory, is the most desirable period, for the following reasons. It gives a minimum amount of time:

1. For the cocci to agglutinate, and for the leucocytes to take up clumps. Very few leucocytes contain over ten cocci, and hence very few have to be omitted in the counting.

2. For the emulsion to settle, which it has a marked tendency to do.

The bacterial average does not vary over

[1] Figs. 32 to 41 inclusive show charts with history records of ten cases of acute gonorrhea; Figs. 42 to 49 inclusive, eight cases of chronic gonorrhea.

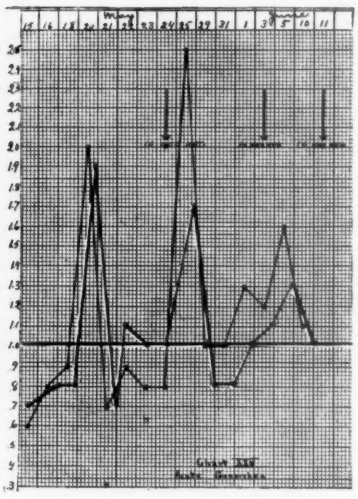


Fig. 34. Patient No. 25. Age 19. Previous attacks, none. Present attack began April 5, 1907. Complications: Arthritis right knee began May 10, requiring opening and drainage. Temperature, 102, drops to normal. Sub. Syms: Severe pain in right knee.

RECORD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's. | Inj. | Sub. Syms. | Physical Find's | | Urine | |
|---|---|---|---|---|---|---|---|
| | | | | Urethral | Complications | Pus | G.C. |
| May 18 | .8 | | | | | | |
| May 19 | 2.0 after joint opened & drained | | | | | + | + |
| May 24 | 1.0 | 10,000,000 | Severe pain in knee | Considerable | Arthritis right knee | | |
| June 3 | 1.4 | 10,000,000 | Decreased | | Improved | Decreased | Decreased |

.3 or .4 when the same serum is run through twice with an interval of seven minutes. With an interval of 20 minutes the range may vary from .5 to .8 of a point.

Different emulsions made from different days' growth of the same strain do not settle with equal rapidity, and some days the clumps are broken up with greater difficulty than others. On rare occasions there will be a growth where the clumping renders the work inaccurate, and the blood must be placed in the refrigerator and run through the following day.

There are four main sources of error in running through:

1. In skimming the normal salt solution off

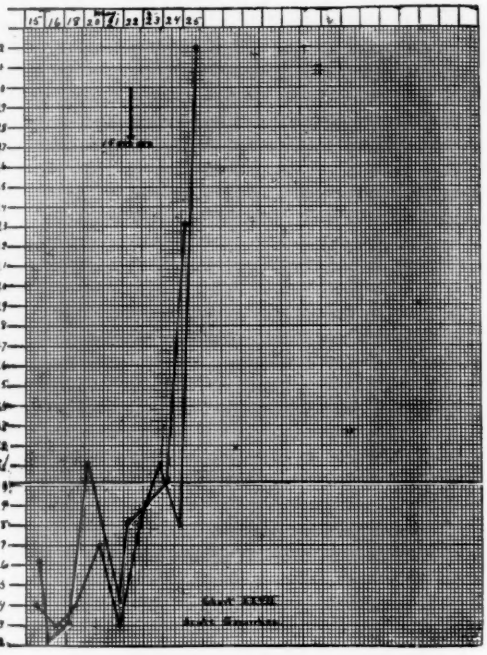


Fig. 35. Patient No. 27. Entered hospital May 13, 1907. Age 27. Previous attacks, 1. Present attack 3 weeks' duration. Acute. Complications: Spermato-cystitis. Epididymitis. Orchitis. Left side funiculitis. Sub. Syms: Pain in left cord and left testicle.

RECORD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's. | Inj. | Sub. Syms. | Physical Find's | | Urine | |
|---|---|---|---|---|---|---|---|
| | | | | Urethral Discharge | Complications, See History Above | Pus | G. C. |
| May 13 | | | See clinical hist. | | | | |
| May 20 | | | | | | | |
| May 22 | .5 | 15,000,000 | | | | Slight | ? |
| May 26 | 1.7 | | | Scanty | Prostate small, rt. sem. ves. palpable Orchitis imp. | | |

the cream. Every possible drop should be removed, as normal salt promotes phagocytosis of gonococci.

2. In fishing for the leucocytes. Great care should be used in taking similar volumes of the leucocytes each time, *i. e.* dipping just below the surface to avoid any remnant of normal salt, and not too deeply, lest the layer of leucocytes be passed.

Removing all the leucocytes at first and gently mixing them in a watch-glass avoids this error, but the manipulation of the leucocytes tends to break them up, and renders their margins less distinct in staining.

3. In taking exactly the same volume of leucocytes, serum and emulsion. This is easily mastered by practice.

4. In blowing a drop of the mixture (cream, serum, and emulsion) on to the slide. Greatest care should be exercised to have these drops similar in size, so that the smears may be similar when ready to count.

### D. COUNTING THE SLIDES

The chances for error in counting are so great that only long experience and rigid adherence to an established standard will give accurate results. Having obtained similar smears, the slides must be carefully examined under low power and similar fields selected for counting. The same person should, of course, count the normal slides who counts the patients' slide. We have used for the pool an average of counts of 2 or 3 normal individuals, run through separately, in place of primarily mixing equal volumes of serum of 3 normal individuals into a pool and counting one slide.

I do not consider that one individual can constitute an accurate pool in working with the gonococcus, for three normals frequently run with bacterial averages like these: 1.0, 1.2, 1.8, — making an average of 1.3, which would give vastly different results than a divisor of 1.8. The personal equation must play an important part, but after hundreds of decisions one quickly concludes whether an organism is within or without a leucocyte. When I have a bacterial average between 0.8 and 2.0, I count with a numerical standard of 10 gonococci as a maximum number per leucocyte. Any leucocyte containing over ten gonococci is omitted, whether they can be readily counted or not. If one used a higher bacterial average, the numerical standard must necessarily be raised.

### E. STAINING

The following method gives a clean, well stained slide with no precipitate, an important feature in counting cocci. 30 slides can be easily stained in 25 minutes. Three solutions

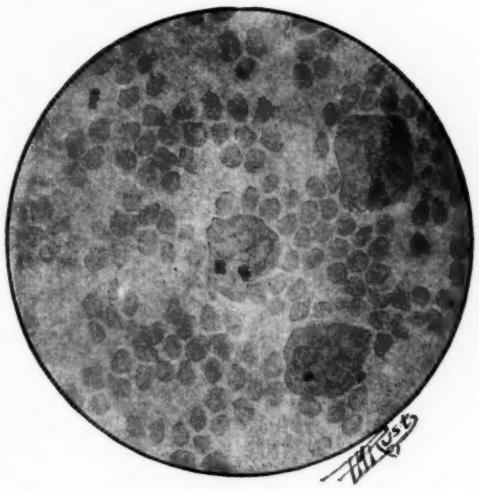


Plate I. Gonococci ingested by leucocytes. Stain eosin and methylene blue. $\frac{1}{12}$ oil immersion.

are placed in tall staining dishes, holding four slides each.

(1) Fix 1 min. in sat. sol. of $HgCl_2$ and wash in tap water.

(2) 1½ to 2 min. in alkaline Meth. Blue. Wash and blot between filtered paper.

| | |
|---|---|
| Meth. Blue | 1 gm. |
| $Na_2CO_3$ | 1 gm. |
| $H_2O$ | 198 gm. |

### *Preparation of the Vaccine*

One tube of ascitic bouillon (one-half bouillon, one-half ascitic fluid) is inocculated with gonococci and incubated 48 hours. From this growth one-half dozen large test tubes (1 x 8 inch) of ascitic agar are inocculated by pouring about ½ cubic centimeter into each tube, and allowing the ascitic bouillon to slowly flow over the surface. Incubate these 24 to 36 hours. Then add to each enough normal salt to facilitate removal of the growth, and gently rotate the tube from side to side. Sometimes the growth is so adherent that the aid of the platinum needle is necessary. This suspension is poured into one large sterile test tube, which is sealed and shaken vigorously for one hour to break up the clumps. A portion is then removed for standardizing, the tube resealed and placed in water at 58°C. for one hour.

### *The Dosage*

10,000,000 gonococci is the average dose which has raised the opsonic index the most

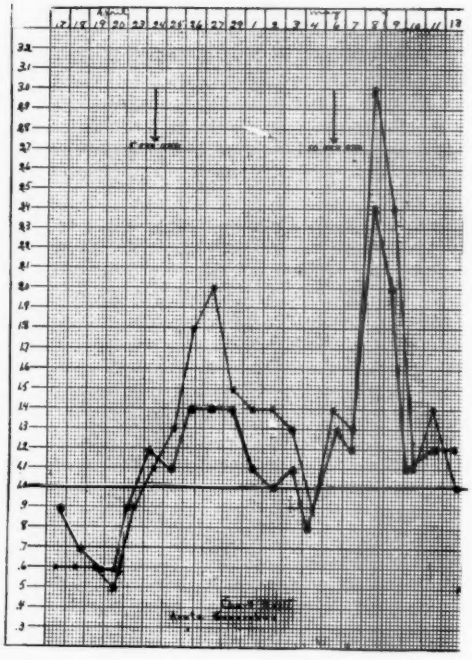


Fig. 36. Patient No. 18. Entered hospital April 13, 1907 Age 19. Previous attacks,? Present attack, 10 days' duration. Acute urethritis. Complications: Prostatitis and seminal vesiculitis. 2 small strictures. Sub. Syms: Burning and painful urination.

RECORD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's | Inj. | Sub. Syms. | Physical Find's | | Urine | |
|---|---|---|---|---|---|---|---|
| | | | | Urethral Discharge | Complications | Pus | G. C |
| Apr. 24 | .8 | 5.000.000 | Burning urination | Profuse | Prostatitis and seminal vesiculitis | | |
| May 6 | 1.4 | 10,000,000 | Subsid'd | Decreased | | | neg. |
| May 14 | | | | | Left hospital imp. | | |

satisfactorily in adults, 4,000,000 to 8,000,000 in children.

2,500,000 the minimum dose.

20,000,000 the maximum dose we have used thus far.

There is usually a slight local reaction which disappears in two or three days.

We have had no case showing any general reaction.

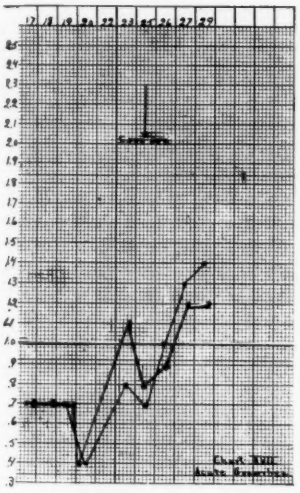


Fig. 37. Patient No. 17. Entered hospital April 15, 1907. Age 26. Previous attacks, none. Present attack, 10 days' duration. Acute urethritis. Complications: Prostatitis and seminal vesiculitis. Sub. Syms.: Burning and frequent urination.

RECORD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's | Inj. | Sub. Syms. | Physical Find's | | Urine | |
|---|---|---|---|---|---|---|---|
| | | | | Urethral Discharge | Complication | Pus | G. C |
| Apr. 24 | .7 | 5.000.000 | Painful and frequent urination | Profuse | Prostatitis Seminal vesiculitis | | |
| Apr. 29 | 1.2 | | Improved | Decreased | Slt. improvement Left Hosp. | | ? |

## II. The Normal Gonococco-opsonic Index.

### A preliminary report of the study of the indices in 30 cases of gonorrhea.

When a smear, made from a suspected gonorrheal discharge, is examined microscopically, one of the salient points leading to a positive diagnosis is the finding of the diplococci crowded into the leucocytes. There is, indeed, no question in the mind of the bacteriologist whether or not the diplococcus of Neisser is subject to phagocytosis; the leucocytes, like gormands, gather up gonococci. But the following questions have recently aroused considerable discussion:

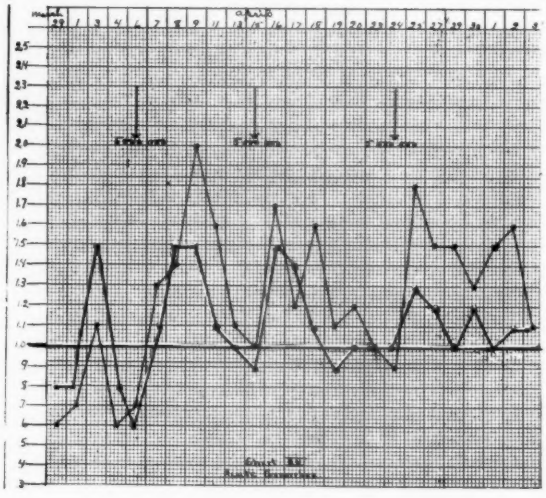


Fig. 38. Patient No. 15. Entered Hospital March 28, 1907. Age 28. Previous attacks, 1. 12 years ago; 3 months' duration. Present attack, 10 days' duration. Acute urethral discharge. Complications: Rectal abscess. Sub. Syms.: Painful and burning urination.

RECORD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's | Inj | Sub. Syms. | Physical Find's | | Urine | |
|---|---|---|---|---|---|---|---|
| | | | | Urethral Discharge | Complications | Pus | G. C. |
| Apr. 6 | .8 | 5,000,000 | Burning urination | Profuse | Rectal abscess | | |
| Apr. 15 | 1.5 | 5,000,000 | | | | | |
| Apr. 24 | 1.2 | 5,000,000 | | | | | |
| May 3 | 1.5 | | Subsided | Very slt. | Left hospital | Few cells | Neg. |

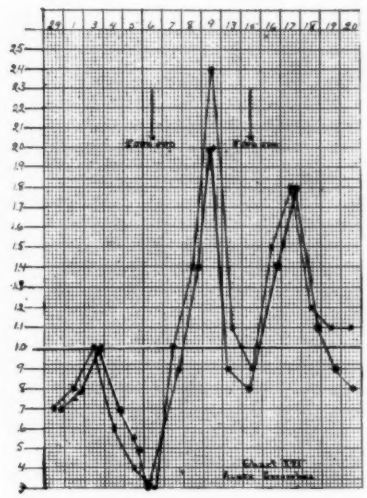


Fig. 39. Patient No. 16. Entered hospital March 26, 1907. Age 19. Previous attacks, none. Present attack, 10 days' duration. Acute urethral discharge. Complications: Acute prostatitis. Sub. Syms.: Painful and frequent urination.

RECORD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's | Inj. | Sub. Syms. | Physical Findings | |
|---|---|---|---|---|---|
| | | | | Urethral Discharge | Complications |
| Apr. 6 | .6 | 5.000.000 | Painful | Profuse | Acute prostatitis |
| Apr. 15 | 1.4 | 5,000,000 | Urination | | |
| Apr. 20 | 1.3 | | | | Left hospital improved |

1. Is there in the blood of normal individuals an approximately equal measure of substances which prepare the gonococci to be taken up by the leucocytes?

2. Have we a technic sufficiently accurate to compute this measure of opsonins?

3. Is there a pathological index, and of what value is it in the diagnosis of gonorrhea?

4. Can we stimulate the production of opsonins by the hypodermatic injection of sterile gonococci?

5. Have we a reliable means of ascertaining the degree of increase of these opsonins, *i. e.*, can the opsonic index be used as a reliable guide in administering the vaccine?

For an answer to the first two questions, you are referred to Tables 1 and 2. The technic used in acquiring the data for these tables is described in the first portion of this paper. In 300 determinations, the gonococco-opsonic index in normal individuals is seen to range from .8 to 1.2, with only 18 exceptions (Table 1). In averaging every 3 successive indices in Table 1, there are only 4 exceptions to this range (Table 2), while a total average of the series of indices of any one of the five normals or a total average of the 51 single determinations of different normals gives in every case an opsonic index of 1.0. Is this not strong evidence in favor of the existence of a normal gonococco-opsonic index? Can a technic used in making such determinations be so grossly inaccurate that it should be condemned as unreliable?

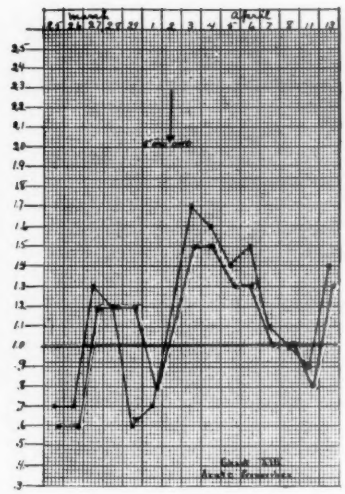


Fig. 40. Patient No. 13. Entered hospital March 20, 1907. Age 37. Previous attacks, 2. 15 years ago. 10 months ago. 3 months' duration. Present attack, 10 days' duration. Acute urethral discharge. Complications, none. Sub. Syms.: Frequent and burning urination.

RECORD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's | Inj. | Sub. Syms. | Physical Find's: Urethral Discharge | Physical Find's: Complications | Urine: Pus | Urine: G. C. |
|---|---|---|---|---|---|---|---|
| Apr. 2 | 1.0 | 5,000,000 | Burning and frequent urination | Profuse | None | | |
| Apr. 15 | 1.3 | | Subsid'd | Slight | Left hospital | | ? |

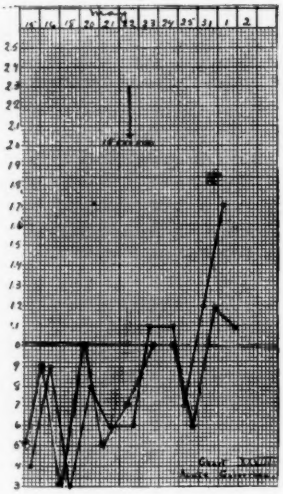


Fig. 41. Patient No. 28. Entered hospital May 14, 1907. Age 18. Previous attacks, none. Present attack, 3 days' duration. Acute. Complications: Chancroids on prepuce. Inguinal lymph glands slightly enlarged. More marked on left side. Sub. Syms: Pain under prepuce.

RECORD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's | Inj. | Sub. Syms. | Physical Find's: Urethral Discharge | Physical Find's: Complications | Urine: Pus | Urine: G. C. |
|---|---|---|---|---|---|---|---|
| May 14 | | | | Profuse | See above | + | + |
| May 20 | | | | Profuse | | | |
| May 22 | .6 | 15,000,000 | | | | | |
| May 26 | | | | Scanty, clear disch'ge | | De-creas-ed | De-creas-ed |
| June 2 | 1.2 | 10,000,000 | | Clear | Prostate im-proved | | |
| June 4 | | | | | Left hospital im-proved | | |

That there are numerous and important sources of error in the technic has been discussed in a previous section of this paper, but that these errors are insurmountable seems untrue.

Conceding then, that there is a *normal* gonococco-opsonic index, we have a working hypothesis and may now discuss the pathological index and its value in diagnosis. That there is a pathological gonococco-opsonic index seems entirely possible, and very probable, but the author wishes to emphasize the fact that the report on this branch of the work is decidedly preliminary.

Determinations of the opsonic index have been made in 13 cases of chronic and 18 cases of acute gonorrhea, making a total of 31 cases. Of this number only one determination was made in 4 cases, two determinations were made in 4 cases, three to ten determinations were made in 23 cases. (See Table 3.) Five of these cases marked with * do not give positive results. Of these 5, 2 cases were examined only once. In the 27 cases examined from 2 to 10 times, there are 3 negative results, making the diagnosis positive in 89 per cent.

The chronic cases show a tendency to run a lower index than the acute cases. In the 13 chronic cases examined 70 per cent gave an O. I. below .8, 30 per cent .8 or above. In the 18

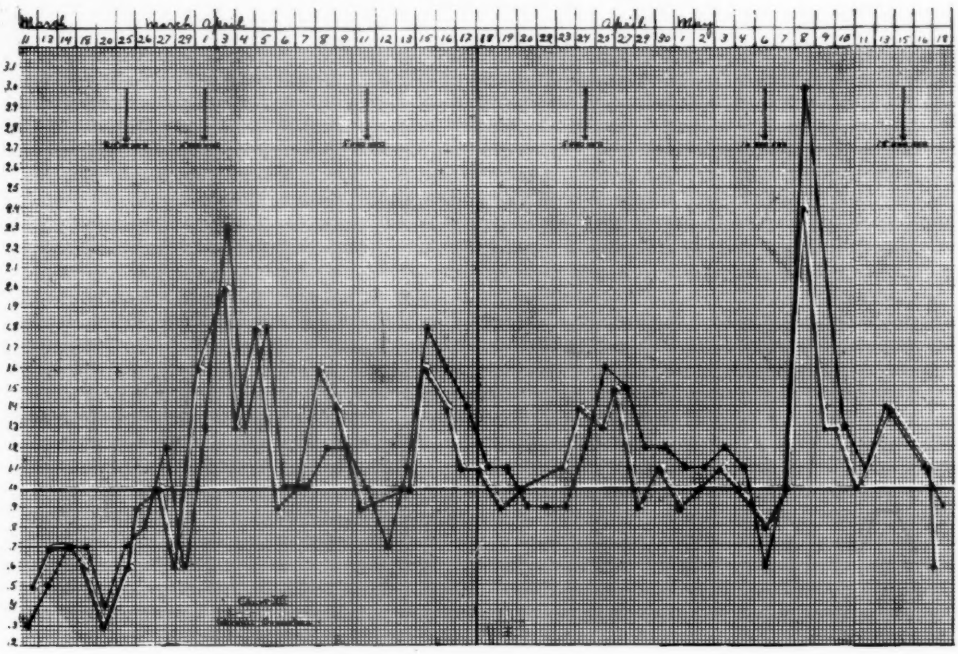


Fig. 42. For legend, see page 407.

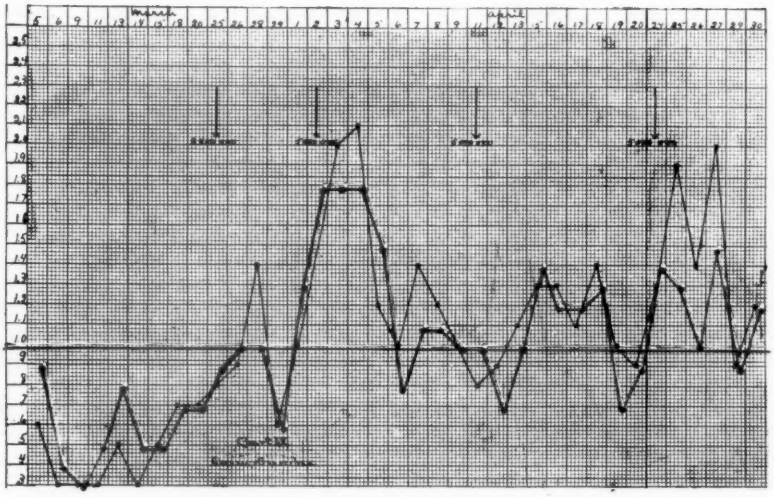


Fig. 43. For legend, see page 407.

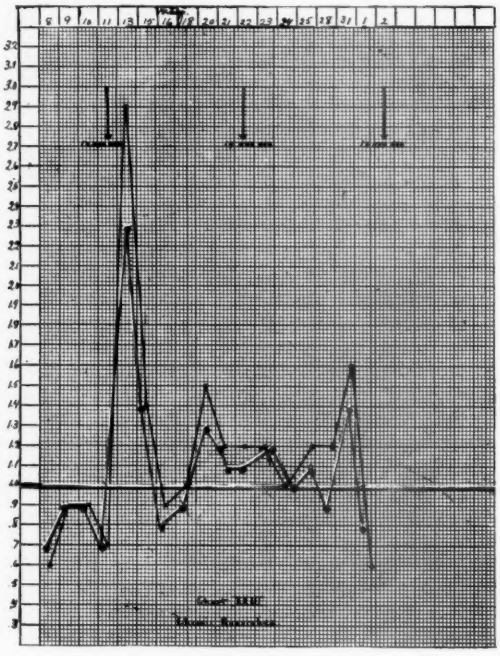


Fig. 44. For legend, see page 407.

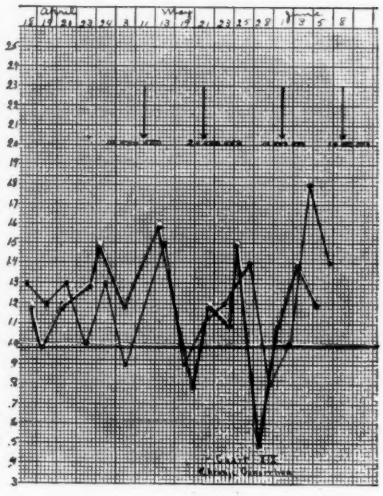


Fig. 45. For legend, see page 407.

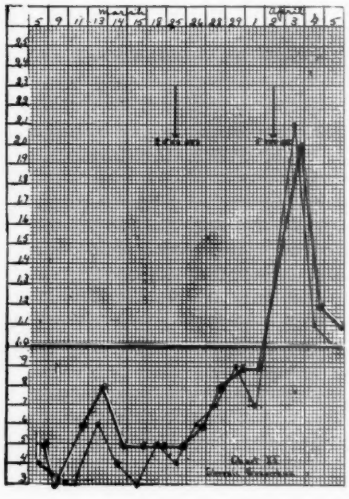


Fig. 46. For legend, see page 408.

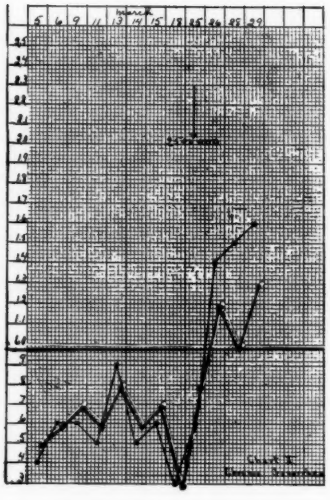


Fig. 47. For legend, see page 408.

Fig. 42. Patient No. 12. Entered hospital March 10. Age 23. Previous attacks, 1. 7 years ago, 10 weeks' duration. Complications: Gonorrheal rheumatism left ankle. Present attack, 4 weeks' duration. Chronic, profuse with urethral discharge. Complications: Prostatitis and seminal vesiculitis. Sub. Syms.: Pain in hip, radiating along course of sciatic nerve. Burning urination.

RECORD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's | Inj. | Sub. Syms. | Physical Find's: Urethral Discharge | Physical Find's: Complications | Urine: Pus: Few cells | Urine: G. C. ? |
|---|---|---|---|---|---|---|---|
| Mar. 25 | .6 | 2,500,000 | Pain along sciatic. Pain in left ankle | Subsided | Gonorreal rheumatism | | |
| Apr. 2 | 1.0 | 5,000,000 | | | | | |
| Apr. 11 | 1.4 | 5,000,000 | | | | | |
| Apr. 24 | 1.2 | 5,000,000 | Disappeared | | | | |
| May 6 | 1.2 | 10,000,000 | Gradually | | | | |
| May 15 | 1.5 | 15,000,000 | | | | | |
| May 18 | | | | | Cured Left hospital | Neg. | Neg. |

Fig. 43. Patient No. 9. February 26, 1907. Age 28. Previous attacks, 2. First, 10 years ago, 2 months' duration. Second, 6 years ago, 6 months' duration. Complications, none. Present attack, 9 months' duration. Chronic urethral discharge. Complications: Acute prostatitis. Seminal vesiculitis. Strictures. Sub. Syms.: Pain in prostatic region radiating down thighs. Frequent and burning urination.

RECORD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's | Dose | Sub. Syms. | Physical Findings: Urethral Discharge | Physical Findings: Complications |
|---|---|---|---|---|---|
| Mar. 25 | .5 | 2,500,000 | Still frequent and burning urination. Pain in prostatic region and down thighs | Slight | Severe prostatitis. Seminal vesiculitis |
| April 2 | 1.0 | 5,000,000 | | | |
| April 11 | 1.4 | 5,000,000 | | | |
| April 24 | 1.3 | 5,000,000 | | | |
| April 30 | 1.5 | | Entirely disapp'r'd | None | Left hospital much imp'd |

acute cases 37½ per cent were below .8, 62½ per cent were .8 or above (see Summary, Table 12).

Case No. 32 shows a decided exception to this tendency. The case was diagnosed clinically chronic gonorrhea, but the first index was found to be 2.4. The following day gave an index of .6. Five days later word came that the patient was running a temperature of 104° and too ill to be disturbed — clinical

Fig. 44. Patient No. 23. Entered hospital May 7, 1907. Age 28. Previous attacks, none. Present attack, four weeks' duration. Chronic. Complications: Bursitis left knee. Prostatitis. Sub. Syms.: Left knee very painful.

RECOAD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's | Inj. | Sub. Syms. | Physical Findings: Urethral Discharge | Physical Findings: Complications |
|---|---|---|---|---|---|
| May 11 | .8 | 10,000,000 | Pain in knee | Profuse | Prostatitis Gonorrheal bursitis |
| May 20 | | | | | |
| May 22 | 1.4 | 15,000,000 slt. local react | | | |
| May 26 | | | Pain in knee | Scanty watery discharge | Nodular prostate. Gonorrheal bursitis not much imp'd |
| June 2 | 1.1 | 10.000,000 | | Scanty yellow disch'ge | Bursitis Swelling less. Slt. tenderness on surface of head of tibia. Prostate surface slightly irregular. Otherwise neg. |
| June 9 | | | Absent | Absent | Prostate negative |
| June 10 | 1.2 | 10,000.000 | Absent | Absent | Negative |

Fig. 45. Patient No. 19. Came to laboratory April 18, 1907. Age 19. Previous attacks, 5. First 5 years ago. Present attack, 4 months' duration. Chronic uretritis. No complications.

RECORD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's. | Inj. | Sub. Syms. | Physical Find's: Urethral Discharge | Physical Find's: Complications | Urine: Pus + + | Urine: G. C. Few |
|---|---|---|---|---|---|---|---|
| May 11 | 1.1 | 10,000,000 | None | Considerable | None | Much less | Few |
| May 21 | 1.3 | 20,000,000 | | | | | |
| June 1 | 1.1 | 20,000,000 | | | | | |
| June 8 | | 10,000,000 | | | | Less | Very few |

diagnosis, pyelonephritis. The auto-infection of the patient showed, therefore, in the blood several days before it was discernible clinically.

Case No. 25, Fig. 34 — clinical diagnosis, gonorrheal arthritis — gave on May 15, 16 and 18, the indices .6, .8, .9. On the 20th the index was 2.0, and the author learned that on the 19th the knee joint had been opened and drained.

We now come to the question, Can we raise the opsonic index by hypodermatic injections of dead gonococci? Tables 4 and 5 show a

Fig. 46. Patient No. 11. Entered hospital January 18. Age 32. Previous attacks, none. Present attack, 6 months' duration. Chronic urethral discharge. Complications: Prostatitis and epididymitis. Sub. Syms.: Pain along spermatic cords and in prostatic region.

RECORD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's | Inj. | Sub. Syms. | Physical Findings | |
|---|---|---|---|---|---|
| | | | | Urethral Discharge | Complications |
| Mar. 25 | .4 | 2,500,000 | Slt. pain along spermatic cords and in prostatic region | Slight | Prostatitis Epididymitis |
| April 2 | .7 | 5,000,000 | Improved | | Much imp'd Left hospital |

Fig. 47. Patient No. 10. Entered hospital February 4. Age 44. Previous attacks, 1. 6 years ago, 3 months' duration. Present attack, 3 months' duration. Chronic profuse urethral discharge. Complications: Orchitis. Epididymitis. Strictures. Sub. Syms.: Pain disappeared before injections were begun.

RECORD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's | Dose | Sub. Syms. Pain Sub | Physical Findings | |
|---|---|---|---|---|---|
| | | | | Urethral Discharge | Complications |
| Mar. 25 | .6 | 2,500,000 | Absent | Slight | Strictures |
| Mar. 29 | 1.5 | | | Disappeared | Left hospital Strictures dilatable |

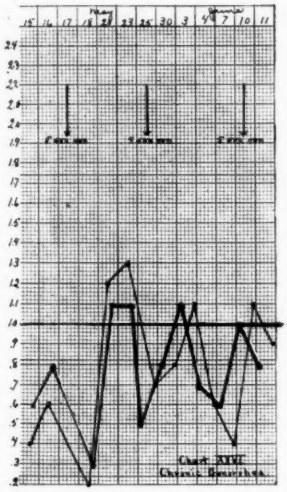


Fig. 48. Patient No. 26. First seen May 15, 1907. Age 4. Previous attacks, none. Present attack, 2 months' duration. Chronic vulvo-vaginitis. Considerable discharge. No subjective symptoms.

RECORD OF CASE

| | Average O. I. Before Vaccine Treatment and Between Inj's | Inj. | Sub. Syms. | Physical Find's | | Urine | |
|---|---|---|---|---|---|---|---|
| | | | | Urethral Discharge | Complications | Pus | G. C. |
| May 7 | .5 | 5,000,000 | None | Considerable | Vulvo-vaginitis | + | + |
| May 25 | .9 | 4,000,000 | | Slight | Improved less redness | + | + |
| June 3 | 1.0 | 5,000,000 | | Less | | Less | Less |
| June 10 | .7 | 5,000,000 | | Much less | | Less | Very few |
| June 19 | 1.1 | 5,000,000 | | Scarcely visible for 3 days | | Much Less | More |

series of 18 cases, 10 acute and 8 chronic, who received injections of gonococcus vaccine, 46 injections altogether being given. Table 7 is a summary showing the relative results from gonococcus vaccine, in dosage ranging from 2,500,000 to 20,000,000 gonococci. This is offered only as a preliminary report. Charts, bearing numbers corresponding to numbers of patients, are given below to show a more graphic picture of the rise and fall of the index.

Throughout the tables and charts it has been the desire of the author to show the relation existing between the phagocytic index (P. I.[1]) and the opsonic index (O. I). Dr. Simon has discussed this relation and the index has been called the Simon index. Table 1 shows a striking similarity between the normal opsonic and phagocytic indices.

The 300 determinations show only 9 more exceptions to the normal range in the P. I. than in the O. I., while the total average in each of every series was 1.0.

In Table 3 a comparison of the indices for diagnosis shows that — in 26 cases — the P. I. and the O. I. were alike in 10 cases, varied only .1 in 12 cases and .2 in 4 cases.

In 5 of the early cases only the P. I. was determined, because of the persistence of the strain to clump.

The summary of Table 6 was designed especially to show the relation of the pathological P. I. to the pathological O. I. After 36 injections the highest P. I. came on the same day as the highest O. I. in 94.4 per cent. After

[1] To obtain the Phagocytic Index: (*a*) Count the number of phagocytes in 50 leucocytes on the patient's slide; (*b*) count the number of phagocytes in 50 leucocytes in the pool; (*c*) phagocytic Index equals a divided by b.

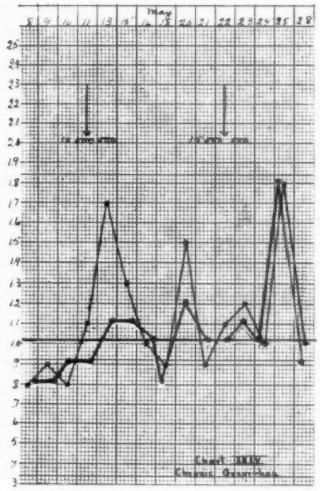


Fig. 49. Patient No. 24. Entered hospital May 6, 1907. Age 20. Previous attacks, none. Present attack, 3 months' duration. Chronic. Complications: Prostatitis. Epididymitis. Right seminal vesiculitis. Hydrocele right side. Slight funiculitis. Sub. Syms.: Pain in right testicle.

RECORD OF CASE

| | Average O. I. before vaccine treatment and between inj's | Inj. | Sub. Syms. | Physical Find's: Urethral Discharge | Physical Find's: Complications | Urine: Pus | Urine: G. C. |
|---|---|---|---|---|---|---|---|
| May 6 | | | Pain in right testicle | Profuse | See clinical hist. | + | + |
| May 11 | .9 | 10.000 000 | | Profuse | | | |
| May 20 | | | | Scanty | | | |
| May 22 | 1.2 | 15.000,000 Slt. local | | Scanty watery disch'ge | Funiculitis well. Epididymitis well. Both seminal vesicles still enlarged, hard and palpable. Prostate small | Decreased | ? |
| May 26 | | | | | | | |
| May 28 | | | | | Left hos. | | |

34 injections the day of the lowest P. I. was the same as the lowest O. I. in 88 per cent. After 31 injections the P. I. fell to 1.0 or below on the same day as the O. I. in 80 per cent.

TABLE 2

Average of every 3 successive indices in Table 1

| V | | L | | H | | G | | J | | 51 different normals | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P.I. | O.I. | P.I. | O.I. | P.I. | O.I. | P.I. | O.I. | P.I. | O.I. | P.I. | O.I. |
| 1.1 | 1.2 | 1.0 | 1.2 | 1.0 | 1.0 | 1.0 | 1.1 | 1.0 | 1.1 | 1.0 | 1.0 |
| 1.0 | .9 | .9 | 1.0 | .8 | .9 | 1.3 | 1.4 | .9 | 1.0 | 1.1 | .9 |
| 1.0 | .9 | 1.1 | 1.0 | 1.1 | .9 | .9 | 1.0 | 1.2 | 1.0 | 1.0 | 1.1 |
| .8 | 1.0 | 1.1 | 1.0 | 1.1 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.2 |
| 1.0 | 1.0 | 1.0 | .9 | .9 | .9 | 1.0 | 1.1 | 1.0 | 1.1 | 1.0 | .9 |
| .9 | .9 | .9 | 1.0 | .9 | .9 | .9 | .9 | .9 | 1.1 | .9 | .9 |
| 1.1 | 1.1 | 1.0 | .9 | 1.0 | 1.0 | 1.0 | 1.1 | 1.0 | 1.0 | 1.0 | .9 |
| 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | .9 | 1.1 | 1.0 | 1.0 | 1.0 |
| 1.0 | 1.0 | 1.0 | .9 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | .9 |
| 1.0 | 1.1 | .9 | 1.0 | | | 1.1 | 1.1 | 1.0 | 1.0 | 1.0 | .9 |
| 1.0 | 1.0 | .9 | .9 | | | 1.0 | 1.0 | .9 | .9 | .9 | 1.0 |
| .9 | .9 | .9 | .9 | | | 1.0 | 1.0 | .8 | .9 | 1.1 | 1.0 |
| .9 | .9 | .9 | 1.0 | | | 1.0 | 1.0 | .9 | 1.0 | 1.4 | 1.2 |
| 1.1 | 1.0 | 1.0 | 1.0 | | | .9 | .9 | .9 | 1.0 | 1.3 | 1.1 |
| .9 | 1.0 | 1.1 | 1.1 | | | 1.0 | 1.0 | | | .9 | 1.1 |
| 1.1 | 1.1 | 1.0 | .9 | | | 1.1 | 1.0 | | | 1.1 | .9 |
| 1.1 | 1.1 | 1.0 | 1.0 | | | 1.0 | 1.0 | | | 1.1 | 1.0 |
| 1.1 | 1.1 | .9 | .9 | | | .8 | .9 | | | | |
| 1.3 | 1.3 | 1.0 | .9 | | | 1.0 | 1.0 | | | | |
| 1.0 | .9 | 1.0 | 1.0 | | | 1.1 | 1.0 | | | | |
| 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

Total average.

Exceptions: P. I. was 1.3 in 3 cases; P. I. was 1.4 in 1 case — 4 cases
O. I. was 1.3 in 1 case; O. I. was 1.4 in 1 case — 2 cases

Table 7 shows the average day of highest P. I. to be the same as the day of the highest O. I. throughout the different sized doses. The same is true with the average day of the lowest P. I. and O. I. The average day the P. I. fell to 1.0 or below is seen to be 1 day earlier than the O. I., after the three series of cases injected with 5,000,000,— 10,000,000 and 15,000,000. 2,500,000 and 20,000,000, given each in one case, were followed by the P. I. and O. I. falling to 1.0 or below on the same day.

A study of the charts shows that there is nearly always a secondary rise in the O. I. after it falls to 1.0 or below, and the P. I. practically always rises with it. The injections were, therefore, often delayed to watch this rise.

The author again wishes to repeat that the study of the pathological index is offered as a very preliminary report.

## TABLE 1

300 Estimations of the Gonococco-opsonic Index in normal individuals

60 estimations in 3 different individuals = 180
42 estimations in one individual = 42
27 estimations in one individual = 27
1 estimation in 51 different individuals = 51

Total, 300

| V 60 Determinations | | L 60 Determinations | | H 27 Determinations | | G 60 Determinations | | J 42 Determinations | | | | 51 Normals 1 Determination | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | | | P. I. | O. I. |
| 1.3 | 1.5 | 1.0 | 1.4 | 1.2 | 1.0 | 1.1 | 1.5 | 1.2 | 1.5 | | | Nor'l | 1 | .9 | .8 |
| .8 | 1.1 | 1.1 | 1.1 | .7 | .9 | .9 | .9 | 1.0 | 1.0 | | | " | 2 | 1.4 | 1.1 |
| 1.2 | 1.1 | .9 | 1.0 | 1.0 | 1.0 | .9 | .9 | .8 | .9 | | | " | 3 | .8 | 1.1 |
| 1.1 | 1.0 | .9 | .9 | .9 | 1.0 | 1.4 | 1.3 | .9 | 1.1 | | | " | 4 | .9 | .9 |
| .9 | 1.0 | 1.0 | 1.0 | .6 | .7 | 1.2 | 1.5 | .8 | .9 | | | " | 5 | 1.1 | .9 |
| 1.0 | .7 | .9 | 1.0 | .9 | .9 | 1.2 | 1.3 | 1.0 | 1.0 | | | " | 6 | 1.2 | .9 |
| 1.0 | .8 | .9 | .7 | 1.1 | 1.0 | 1.0 | 1.2 | 1.2 | .9 | | | " | 7 | .9 | 1.1 |
| 1.3 | 1.1 | 1.0 | 1.1 | 1.0 | 1.0 | .8 | .9 | 1.2 | 1.0 | | | " | 8 | .9 | .9 |
| .7 | .8 | 1.3 | 1.1 | 1.2 | .8 | .9 | .9 | 1.1 | 1.0 | | | " | 9 | 1.3 | 1.2 |
| 1.0 | 1.0 | 1.0 | 1.0 | 1.1 | .9 | 1.0 | .9 | 1.2 | 1.2 | | | " | 10 | .8 | 1.2 |
| .9 | 1.1 | 1.0 | 1.0 | 1.3 | 1.2 | 1.0 | 1.0 | .9 | .9 | | | " | 11 | .9 | 1.3 |
| .9 | .9 | 1.2 | 1.1 | .9 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | | | " | 12 | 1.2 | 1.2 |
| 1.1 | .9 | 1.1 | 1.0 | .8 | .8 | 1.1 | 1.1 | 1.0 | 1.2 | | | " | 13 | .9 | .7 |
| 1.0 | .9 | 1.0 | .9 | 1.0 | .9 | 1.0 | 1.0 | 1.2 | 1.1 | | | " | 14 | .9 | .8 |
| 1.0 | 1.0 | .8 | .9 | .9 | .9 | 1.0 | 1.2 | .9 | 1.0 | | | " | 15 | 1.1 | 1.1 |
| 1.0 | 1.0 | 1.0 | 1.0 | .9 | .9 | 1.0 | 1.0 | .8 | 1.0 | | | " | 16 | 1.0 | .9 |
| .9 | .8 | .9 | .8 | 1.0 | 1.0 | .9 | .9 | .9 | 1.1 | | | " | 17 | .9 | 1.0 |
| .9 | 1.0 | .9 | 1.2 | .9 | .9 | .9 | .9 | 1.0 | 1.1 | | | " | 18 | .8 | .9 |
| .8 | .9 | .9 | .8 | 1.0 | .9 | 1.2 | 1.2 | 1.0 | 1.0 | | | " | 19 | .8 | .8 |
| 1.2 | 1.0 | 1.2 | 1.0 | 1.0 | 1.1 | .9 | 1.1 | 1.0 | 1.0 | | | " | 20 | 1.3 | 1.1 |
| 1.2 | 1.4 | .9 | 1.0 | 1.0 | 1.1 | .9 | 1.0 | 1.1 | 1.1 | | | " | 21 | .8 | .8 |
| .9 | .8 | .8 | .9 | .8 | .9 | 1.2 | 1.0 | 1.1 | 1.1 | | | " | 22 | 1.2 | 1.1 |
| .9 | 1.0 | 1.1 | 1.0 | 1.0 | 1.0 | .9 | 1.0 | 1.1 | 1.0 | | | " | 23 | .9 | .9 |
| 1.3 | 1.2 | 1.2 | 1.0 | 1.3 | 1.1 | .8 | .8 | 1.1 | .9 | | | " | 24 | .9 | .9 |
| 1.0 | 1.1 | 1.1 | 1.0 | 1.3 | 1.3 | 1.1 | 1.1 | 1.1 | 1.0 | | | " | 25 | .8 | .8 |
| 1.0 | 1.0 | .8 | .9 | .8 | .9 | .9 | 1.0 | .9 | 1.0 | | | " | 26 | 1.1 | .9 |
| 1.0 | 1.0 | 1.0 | .8 | 1.0 | .9 | 1.1 | 1.0 | 1.0 | 1.0 | | | " | 27 | 1.0 | 1.0 |
| 1.0 | 1.2 | .8 | 1.0 | | | 1.1 | 1.3 | .8 | .9 | | | " | 28 | 1.1 | 1.0 |
| 1.0 | 1.0 | 1.1 | 1.0 | | | 1.0 | 1.0 | 1.0 | .9 | | | " | 29 | 1.1 | 1.0 |
| 1.1 | 1.0 | .8 | .9 | | | 1.1 | 1.1 | 1.1 | 1.0 | | | " | 30 | .9 | .8 |
| 1.0 | 1.0 | .8 | .8 | | | 1.1 | 1.1 | .9 | .9 | | | " | 31 | .8 | 1.1 |
| 1.1 | 1.0 | .9 | .9 | | | .9 | 1.0 | .9 | .9 | | | " | 32 | 1.0 | .9 |
| 1.0 | 1.0 | .9 | 1.0 | | | 1.0 | 1.0 | .8 | .9 | | | " | 33 | .8 | .9 |
| .8 | 1.0 | 1.0 | .9 | | | 1.0 | 1.0 | .7 | .9 | | | " | 34 | .8 | .9 |
| 1.1 | .9 | .9 | 1.0 | | | 1.0 | .9 | .7 | .8 | | | " | 35 | 1.2 | 1.2 |
| .9 | .9 | .9 | .9 | | | 1.1 | 1.0 | 1.0 | 1.0 | | | " | 36 | 1.2 | 1.0 |
| .9 | .9 | 1.0 | 1.1 | | | .9 | .9 | .9 | 1.0 | | | " | 37 | 1.2 | 1.2 |
| .9 | .9 | .9 | 1.0 | | | 1.0 | 1.0 | 1.0 | 1.0 | | | " | 38 | 1.5 | 1.0 |
| .9 | 1.0 | 1.0 | 1.0 | | | 1.1 | 1.0 | .8 | .9 | | | " | 39 | 1.4 | 1.4 |
| 1.1 | .9 | 1.2 | 1.1 | | | 1.1 | 1.1 | .9 | 1.0 | | | " | 40 | 1.4 | 1.0 |
| 1.1 | 1.1 | 1.0 | 1.0 | | | .9 | .9 | .9 | .9 | | | " | 41 | .9 | 1.0 |
| 1.0 | 1.0 | .9 | .9 | | | .8 | .8 | 1.0 | 1.0 | | | " | 42 | 1.5 | 1.2 |
| .8 | .7 | 1.2 | 1.1 | | | 1.0 | .9 | | | | | " | 43 | 1 5 | 1.2 |
| 1.1 | 1.2 | 1.0 | 1.0 | | | 1.1 | 1.0 | | | | | " | 44 | 1.2 | 1.0 |
| .9 | 1.0 | 1.2 | 1.1 | | | .9 | .9 | | | | | " | 45 | .9 | 1.0 |
| 1.3 | 1.2 | 1.0 | .8 | | | 1.1 | 1.1 | | | | | " | 46 | .9 | .9 |
| 1.0 | 1.1 | 1.0 | 1.0 | | | 1.3 | 1.1 | | | | | " | 47 | 1.2 | .9 |
| 1.1 | 1.0 | .9 | .9 | | | .9 | . 9 | | | | | " | 48 | 1.1 | .9 |
| 1.1 | 1.1 | 1.2 | 1.1 | | | 1.1 | 1.1 | | | | | " | 49 | 1.0 | 1.2 |
| 1.2 | 1.1 | .8 | 1.0 | | | 1.0 | 1.0 | | | | | " | 50 | 1.1 | .9 |
| 1.1 | 1.0 | 1.0 | .9 | | | 1.0 | 1.0 | | | | | " | 51 | 1.2 | 1.0 |
| 1.1 | 1.1 | .8 | .8 | | | .7 | 1.0 | | | | | | | | |
| 1.0 | 1.1 | .9 | .9 | | | 1.0 | .8 | | | | | | | | |
| 1.3 | 1.0 | 1.0 | .9 | | | .8 | .9 | | | | | | | | |
| 1.3 | 1.1 | .9 | .9 | | | .8 | .8 | | | | | | | | |
| 1.5 | 1.5 | .9 | .8 | | | 1.1 | 1.0 | | | | | | | | |
| 1.2 | 1.2 | 1.1 | 1.1 | | | 1.0 | 1.1 | | | | | | | | |
| .9 | .9 | 1.1 | 1.0 | | | 1.2 | 1.1 | | | | | | | | |
| .9 | .9 | 1.0 | 1.1 | | | 1.1 | 1.1 | | | | | | | | |
| 1.1 | 1.0 | .8 | .8 | | | 1.0 | .8 | | | | | | | | |
| 1.0 | 1.0 | 1.0 | 1.0 | | | 1.0 | 1.0 | 1.0 | 1.0 | | | | | 1.0 | 1.0 |

Total average.

Therefore normal range of Gonococco-opsonic Index is .8 to 1.2.

Exceptions: P. I. was .6 in 1 case
.7 in 5 cases
1.3 in 13 cases
1.4 in 4 cases
1.5 in 4 cases

Total: P. I. showed 27 exceptions.

O. I. was .7 in 5 cases
1.3 in 5 cases
1.4 in 3 cases
1.5 in 5 cases

O. I. showed 18 exceptions.

## TABLE 3

CHRONIC GONORRHEA

Opsonic Indices before Vaccine Treatment

| No. 1 | | No. 4 | | No. 5 | | No. 9 | | No. 10 | | No. 11 | | No. 12 | | No. 19 | | No. 21 | | No. 24 | | No. 26 | | No. 27 | | No. 32 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | | | | | | | | | |
| 1.3 | | 1.2 | | 1.0 | | .9 | .6 | .5 | .4 | .5 | .4 | .5 | .3 | 1.2 | 1.2 | .7 | .7 | .8 | .8 | .6 | .4 | .6 | .4 | 2.3 | 2.4 | | | | | | | | |
| .4 | | 1.0 | | 1.2 | | .4 | .3 | .6 | .6 | .3 | .3 | .7 | .5 | 1.0 | 1.3 | .7 | .6 | .8 | .9 | .8 | .6 | .2 | .3 | .6 | .6 | | | | | | | | |
| .2 | | .7 | | .6 | | .3 | .3 | .7 | .6 | .6 | .3 | .7 | .7 | 1.2 | 1.0 | .8 | .6 | .9 | .8 | | | .3 | .4 | | | | | | | | | | |
| .7 | | .7 | | .6 | | .5 | .3 | .6 | .5 | .8 | .6 | .6 | .7 | 1.3 | 1.3 | .6 | .7 | .9 | 1.1 | | | 1.1 | .7 | | | | | | | | | | |
| .3 | | .7 | | .6 | | .8 | .5 | .8 | .9 | .5 | .4 | .3 | .4 | 1.5 | .9 | | | | | | | .4 | .3 | | | | | | | | | | |
| | | .3 | | .2 | | .5 | .3 | .6 | .5 | .5 | .3 | .6 | .7 | 1.2 | | | | | | | | .8 | .8 | | | | | | | | | | |
| | | .6 | | | | .5 | .5 | .7 | .6 | .5 | .5 | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | .7 | .7 | .3 | .3 | .5 | .4 | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | .7 | .7 | .7 | .6 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | .9 | .8 | .8 | .8 | | | | | | * | | | | * | | | | | | | | | | | | | | |
| .6 | | .7 | | .7 | | .6 | .5 | .6 | .6 | .5 | .4 | .6 | .7 | 1.2 | 1.2 | .7 | .7 | .8 | .9 | .7 | .5 | .6 | .5 | 1.5 | 1.5 | | | | | | | | Av'r'ge |

ACUTE GONORRHEA

| No. 2 | | No. 7 | | No. 8 | | No. 13 | | No. 14 | | No. 15 | | No. 16 | | No. 17 | | No. 18 | | No. 20 | | No. 22 | | No. 23 | | No. 28 | | No. 29 | | No. 30 | | No. 31 | | No. 25 | | No. 33 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | | | | | | | | |
| .6 | | .8 | | .9 | .8 | .6 | .7 | .7 | 1.0 | .8 | .6 | .7 | .7 | .7 | .7 | .9 | .6 | .8 | .6 | .7 | .7 | .7 | .6 | .5 | .4 | 1.0 | 1.4 | .9 | .8 | 2.1 | 2.1 | .7 | .6 | .9 | .8 | | | | | | | | |
| | | | | .9 | 1.3 | .6 | .7 | .8 | .6 | .8 | .7 | .8 | .8 | .7 | .7 | .7 | .6 | | | .6 | .7 | .9 | .9 | .9 | .6 | 1.2 | 1.3 | .4 | .4 | 1.3 | .9 | .8 | .8 | | | | | | | | | | |
| | | | | .7 | .7 | 1.2 | 1.3 | | | 1.5 | 1.2 | 1.0 | 1.0 | .7 | .7 | .6 | .6 | | | 1.5 | 1.3 | .9 | .9 | .3 | .3 | 1.1 | 1.2 | | | 1.0 | .8 | .8 | .9 | | | | | | | | | | |
| | | | | .7 | .7 | 1.2 | 1.2 | | | .8 | .6 | .7 | .6 | .4 | .4 | .6 | .5 | | | .9 | .9 | .7 | .7 | 1.0 | .8 | | | | | | | .8 | .8 | | | | | | | | | | |
| | | | | .8 | .7 | 1.2 | 1.3 | | | .6 | .7 | .5 | .4 | 1.1 | .8 | .9 | .9 | | | 1.2 | 1.2 | | | .5 | .6 | | | | | | | 1.0 | 2.0 | | | | | | | | | | |
| | | | | .8 | .8 | .8 | .7 | | | | | .3 | .3 | .8 | .7 | 1.2 | 1.1 | | | | | | | .7 | .6 | | | | | | | .9 | .7 | | | | | | | | | | |
| | | | | .6 | .7 | | | | | | | | | | | | | | | | | | | | | | | | | 1.1 | .9 | | | | | | | | | | |
| | | | | .9 | .8 | | | | | | | | | | | | | | | | | | | | | | | | | 1.0 | .8 | | | | | | | | | | |
| | | | | .6 | .6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | * | | 1.0 | .9 | | | | | | | | | | | | | | | * | | | | | | | | | | | | | | * | | | | | | | |
| .6 | | .8 | | .8 | .8 | .9 | 1.0 | .8 | .8 | .9 | .8 | .7 | .6 | .7 | .7 | .8 | .7 | .8 | .6 | .8 | .8 | .8 | .8 | .7 | .6 | 1.4 | 1.6 | .7 | .6 | 1.5 | 1.3 | 1.0 | 1.0 | .9 | .8 | Av'r'ge | | | | | | |

## SUMMARY

| 13 Cases. | | | | 18 Cases. | | | |
|---|---|---|---|---|---|---|---|
| No. of Indices below .8. | | No. of Indices .8 or above. | | No. of Indices below .8. | | No. of Indices .8 or above. | |
| P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. |
| 10<br>77 % | 7<br>70 % | 3<br>23 % | 3<br>30 % | 5<br>28 % | 6<br>37½ % | 13<br>72 % | 10<br>62½ % |
| 2 cases marked with * not pos. without further determinations of indices. | | | | 3 cases marked with * not pos. without further determinations of indices | | | |

## TABLE 4

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS. CHRONIC GONORRHEA

| No. of Patient | Acute or Chron. | Date | No. of Exams. before Vaccine | Av. Ind. before Vaccine | | Av. Ind. between Injections | | Day of Highest Ind. after Injec | | Highest Index after Injection | | Day of Lowest Index after Injec. | | Lowest Index after Injection | | Day Index Fell to 1.0 or Below | | No. of Days before next Injection | Index on Day of Injection | | Dosage | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | P.I. | O.I. | P.I. | O.I. | P.I. | O.I. | P.I. | O.I. | P.I. | O.I. | P.I. | O.I. | P.I. | O.I. | | P.I. | O.I. | | |
| | | | | | | | | | | | | | | | | | | | .0 | .8 | 2,500,000 | |
| No. 9 | Chron. | Mar. 25 | 10 | 0.6 | 0.5 | | | 3rd | 3rd | 1.0 | 1.4 | 4th | 4th | .6 | .6 | 4th | 4th | 8 | | | | |
| | | Apr. 2 | | | | 1.0 | 1.0 | 1st | 2nd | 1.8 | 2.3 | 9th | 9th | .7 | .8 | 4th | 4th | 9 | 1.3 | 1.0 | 5 mil. | |
| | | 11 | | | | 1.2 | 1.4 | 3rd | 7th | 1.4 | 1.4 | 8th | 9th | .7 | .9 | 8th | 9th | 13 | 0.7 | 0.8 | 5 mil. | |
| | | 24 | | | | 1.3 | 1.3 | 3rd | 3rd | 1.5 | 2.0 | 5th | 5th | .9 | 9. | 5th | 5th | | 1.4 | 1.3 | 5 mil. | |
| | | 30 | | | | 1.2 | 1.5 | | | | | | | | | | | | | | | Left hosp. |
| No. 10 | Chron. | Mar. 25 | 9 | 0.6 | 0.6 | | | 4th | 4th | 1.3 | 1.6 | | | | | | | | .8 | .8 | 2,500,000 | |
| | | 29 | | | | 1.2 | 1.5 | | | | | | | | | | | | | | | Left hosp. |
| No. 11 | Chron. | Mar. 25 | 7 | 0.5 | 0.4 | | | 4th | 4th | .9 | .9 | | | | | 1.1 | | 8 | .5 | .4 | 2,500,000 | Did not |
| | | Apr. 2 | | | | 0.8 | 0.7 | 1st | 1st | 2.0 | 2.1 | 5th | 5th | 1.1 | 1.0 | on | 5th | | .9 | .7 | 5 mil. | rise to 1.0 |
| | | 5 | | | | 1.4 | 1.4 | | | | | | | | | 5th | | | | | | Left hosp. |
| No. 12 | Chron. | Mar. 25 | 6 | .6 | .6 | | | 6th | 6th | 1.6 | 1.3 | 4th | 4th | .6 | .6 | 4th | 4th | 7 | .6 | .7 | 2,500,000 | |
| | | Apr. 2 | | | | 1.1 | 1.0 | 1st | 1st | 2.0 | 2.3 | 4th | 4th | .9 | 1.0 | 4th | 4th | 9 | 1.6 | 1.3 | 5 mil. | |
| | | 11 | | | | 1.4 | 1.4 | 4th | 4th | 1.6 | 1.8 | 8th | 9th | .9 | .9 | 8th | 9th | 8 | .9 | 1.0 | 5 mil. | |
| | | 24 | | | | 1.3 | 1.2 | 2nd | 1st | 1.5 | 1.6 | 5th | 7th | .9 | 1.1 | 5th | 9th | 7 | 1.4 | 1.2 | 5 mil. | |
| | | May 6 | | | | 1.1 | 1.2 | 2nd | 2nd | 2.4 | 3.0 | 5th | 5th | 1.0 | 1.1 | 5th | 5th | 9 | .8 | .6 | 10 mil. | |
| | | 15 | | | | 1.5 | 1.5 | | | | | 3rd | 3rd | .6 | .9 | | | | 1.4 | 1.4 | 15 mil. | Did not react |
| | | 18 | | | | .8 | 1.0 | | | | | | | | | | | | | | | Left hosp. |
| No. 23 | Chron. | May 11 | 4 | .8 | .8 | | | 2nd | 2nd | 2.3 | 2.9 | 5th | 5th | .8 | .9 | 5th | 5th | 11 | 1.1 | 1.2 | 10 mil. | |
| | | 22 | | | | 1.3 | 1.4 | 9th | 9th | 1.4 | 1.6 | 10th | 10th | .8 | .6 | 3rd | 3rd | 11 | .8 | .6 | 15 mil. | |
| | | Jun. 2 | | | | 1.1 | 1.1 | | | | | | | | | | | | | | 10 mil. | |
| No. 24 | Chron. | May 11 | 4 | .9 | .9 | | | 2nd | 2nd | 1.2 | 1.7 | 7th | 7th | .8 | .9 | 5th | 5th | 11 | 1.0 | 1.1 | 10 mil. | |
| | | 22 | | | | 1.1 | 1.2 | 3rd | 3rd | 1.8 | 1.8 | 6th | 6th | .9 | 1.0 | 6th | 6th | | 1.0 | 1.1 | 15 mil. | |
| | | 28 | | | | 1.2 | 1.3 | | | | | | | | | | | | | | | Left hosp. |
| No. 19 | Chron. | 11 | 6 | 1.2 | 1.1 | | | 2nd | 3rd | 1.6 | 1.6 | 8th | 8th | .8 | .9 | 8th | 8th | 10 | 1.2 | .9 | 10 mil. | |
| | | 21 | | | | 1.3 | 1.3 | 4th | 4th | 1.5 | 1.4 | 7th | 7th | .5 | .8 | 7th | 7th | 10 | 1.2 | 1.1 | 20 mil. | |
| | | Jun. 1 | | | | 1.1 | 1.1 | 2nd | 2nd | 1.4 | 1.8 | | | | | | | | 1.1 | 1.0 | 20 mil. | |
| No. 26 | Chron. | May 17 | 2 | .7 | .5 | | | 3rd | 6th | 1.1 | 1.3 | 1st | 1st | .3 | .2 | 8th | 8th | 8 | .8 | .6 | 5 mil. | |
| | | 25 | | | | .8 | .9 | 8th | 8th | 1.0 | 1.1 | 5th | 5th | .9 | .8 | | | 8 | .5 | .7 | 4 mil. | |
| | | Jun. 3 | | | | 1.0 | 1.0 | 7th | 7th | 1.0 | 1.0 | 3rd | 4th | .7 | .4 | | | 7 | 1.0 | 1.1 | 5 mil. | |
| | | 10 | | | | .8 | .7 | | | | | | | | | | | | 1.0 | 1.1 | 5 mil. | |

## TABLE 5

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS. ACUTE GONORRHEA

| No. of Patient | Acute or Chron. | Date | No. of Exams. before Vaccine | Av. Ind. before Vaccine | | Av. Ind. between Injections | | Day of Highest Ind. after Injec. | | Highest Index after Injection | | Day of Lowest Index after Injec. | | Lowest Index after Injection | | Day Index Fell to 1.0 or Below | | No. of Days before next Injection | Index on Day of Injection | | Dosage | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | P.I. | O.I. | P.I. | O.I. | P.I. | O.I. | P.I. | O.I. | P.I. | O.I. | P.I. | O.I. | P.I. | O.I. | | P.I. | O.I. | | |
| No. 13 | Acute | Apr. 2 | 6 | .9 | 1.0 | | | 1st | 1st | 1.5 | 1.7 | 9th | 9th | .8 | .9 | 7th | 8th | | .8 | .7 | 5 mil. | |
| | | 13 | | | | 1.2 | 1.3 | | | | | | | | | | | | | | | Left hosp. |
| No. 15 | Acute | 6 | 6 | .9 | .8 | | | 2nd | 2nd | 1.5 | 2.0 | 9th | 9th | .9 | 1.0 | 7th | 9th | 9 | .6 | .7 | 5 mil. | |
| | | 15 | | | | 1.2 | 1.5 | 1st | 1st | 1.5 | 1.7 | 4th | 9th | .9 | .9 | 4th | 9th | 9 | 0.9 | 1.0 | 5 mil. | |
| | | 24 | | | | 1.1 | 1.2 | 1st | 1st | 1.3 | 1.8 | 5th | 9th | 1.0 | 1.1 | 5th | 9th | | 1.0 | .9 | 5 mil. | |
| | | May 3 | | | | 1.1 | 1.5 | | | | | | | | | | | | | | | Left hosp. |
| No. 16 | Acute | Apr. 6 | 6 | .7 | .6 | | | 4th | 4th | 2.0 | 2.4 | 9th | 9th | .8 | .9 | 7th | 9th | 9 | .3 | .3 | 5 mil. | |
| | | 15 | | | | 1.3 | 1.4 | 3rd | 3rd | 1.8 | 1.8 | 5th | 4th | .8 | 1.1 | 4th | 5th | | .8 | .9 | 5 mil. | |
| | | May 20 | | | | 1.2 | 1.3 | | | | | | | | | | | | | | | Left hosp. |
| No. 17 | Acute | Apr. 24 | 6 | .7 | .7 | | | 4th | 5th | 1.2 | 1.4 | | | | | Did not fall to 1.0 | | | .8 | .7 | 5 mil. | |
| | | 29 | | | | 1.1 | 1.2 | | | | | | | | | | | | | | | Left hosp. |
| No. 18 | Acute | 24 | 6 | .8 | .7 | | | 2nd | 3rd | 1.4 | 2.0 | 10th | 10th | .8 | .9 | 8th | 10th | 12 | .8 | .9 | 5 mil. | |
| | | 6 | | | | 1.2 | 1.4 | 2nd | 2nd | 2.4 | 3.0 | 4th | 7th | 1.1 | 1.0 | 4th | 7th | | 1.3 | 1.4 | 10 mil. | |
| | | 13 | | | | 1.5 | 1.7 | | | | | | | | | | | | | | | Left hosp. |
| No. 21 | Acute | May 1 | 4 | .7 | .7 | | | 2nd | 2nd | 1.8 | 1.8 | 5th | 5th | .6 | .5 | 5th | 5th | 5 | .6 | .7 | 5 mil. | |
| | | 6 | | | | 1.1 | 1.0 | 2nd | 2nd | 1.6 | 2.0 | 7th | 7th | .5 | .5 | 4th | 5th | 9 | .8 | 1.0 | 10 mil. | |
| | | 15 | | | | .9 | 1.1 | 5th | 5th | 1.2 | 1.9 | 6th | 6th | .7 | .7 | 6th | 6th | 9 | .8 | 1.0 | 15 mil. | |
| | | 22 | | | | 1.0 | 1.2 | | | | | | | | | | | | 1.0 | 1.1 | 15 mil. | Did not react |
| | | Jun. 1 | | | | 1.0 | 1.0 | | | | | | | | | | | | | | | |
| No. 22 | Acute | May 6 | 5 | 1.0 | 1.0 | | | 4th | 2nd | 1.3 | 1.7 | 5th | 5th | .5 | .7 | 5th | 5th | 9 | 1.2 | 1.2 | 5 mil. | |
| | | 15 | | | | 1.1 | 1.2 | 2nd | 2nd | 1.3 | 2.0 | 6th | 6th | .8 | .6 | 3rd | 6th | 7 | 1.2 | 1.3 | 15 mil. | |
| | | 22 | | | | 1.1 | 1.2 | | | 1.1 | 1.1 | 6th | 6th | .7 | .8 | 3rd | 6th | | 1.0 | 1.1 | 15 mil. | Did not react |
| | | 25 | | | | 1.0 | 1.0 | | | | | | | | | | | | | | | Left hosp. |
| No. 25 | Acute | 24 | 8 | 1.0 | 1.0 | | | 2nd | 2nd | 1.7 | 2.5 | 5th | 5th | .8 | 1.0 | 5th | 5th | 10 | 1.0 | .8 | 10 mil. | |
| | | Jun. 3 | | | | 1.1 | 1.4 | | | | | | | | | | | | 1.1 | 1.2 | 10 mil. | |
| No. 27 | Acute | May 22 | 6 | .6 | .5 | | | 3rd | 3rd | 2.3 | 3.2 | | | | | | | | .8 | .8 | 15 mil. | |
| | | 25 | | | | 1.4 | 1.7 | | | | | | | | | | | | | | | Left hosp. |
| No. 28 | Acute | May 22 | 6 | .7 | .6 | | | 9th | 9th | 1.1 | 1.7 | 3rd | 3rd | .6 | .7 | 3rd | 3rd | 11 | .7 | .6 | 15 mil. | |
| | | Jun. 2 | | | | 1.0 | 1.2 | | | | | | | | | | | | | | 10 mil. | |

## TABLE 6

Table showing (*a*) the reaction in the blood to gonococcus vaccine in varying dosage; (*b*) the relation between the P. I. and O. I.

| Dosage. | A. 2,500,000 Gonococci. | B. 5 million Gonococci. | C. 10 million Gonococci. | D. 15 million Gonococci. | E. 20 million Gonococci. |
|---|---|---|---|---|---|
| | Day of highest P. I. / Day of highest O. I. | Day of highest P. I. / Day of highest O. I. | Day of highest P. I. / Day of highest O. I. | Day of highest P. I. / Day of highest O. I. | Day of highest P. I. / Day of highest O. I. |
| Day Scale. | 1 2 3 4 5 6 7 / 1 2 3 4 5 6 7 | 1 2 3 4 5 6 7 / 1 2 3 4 5 6 7 | 1 2 3 4 5 6 7 / 1 2 3 4 5 6 7 | 1 2 3 5 6 8 9 / 1 2 3 5 7 8 9 | 1 2 3 4 5 6 7 / 1 2 3 4 5 6 7 |
| | 1 1 2 1 / 1 2 1 | 6 4 3 4 / 6 4 3 2 1 | 7 / 6 1 | 1 2 1 / 2 1 2 1 2 | 1 1 / 1 1 |
| Total No. of Injections. | 4 injections. | 17 injections. | 7 injections. | 6 injections. | 2 injections. |
| No. of days difference between day of highest P. I. & highest O. I. | Day of highest P. I. and O. I. same after each. | 1. Day of highest P. I. and O. I. same after 11 injections.<br>2. Day of highest P. I. 1 day earlier after 3.<br>3. Day of highest P. I. 4 days earlier after 1.<br>5. Day of highest P. I. 2 days later after 1.<br>6. Day of highest P. I. 1 day later after 1. | Day of highest P. I. and O. I. same after 6 injs. P.I. 1 day earlier after 1 injection. | Day of highest P. I. and O. I. same after all. | Day of highest P. I. and O. I. same after both. |
| | Day of lowest P. I. / Day of lowest O. I. | Day of lowest P. I. / Day of lowest O. I. | Day of lowest P. I. / Day of lowest O. I. | Day of lowest P. I. / Day of lowest O. I. | Day of lowest P. I. / Day of lowest O. I. |
| Day Scale. | 1 2 3 4 5 6 7 / 1 2 3 4 5 6 7 | 1 3 4 5 8 9 10 / 1 3 4 5 7 9 10 | 1 3 4 5 6 7 8 / 1 3 4 5 6 7 8 | 1 3 5 6 8 9 10 / 1 3 5 6 8 9 10 | 1 2 3 4 5 6 7 / 1 2 3 4 5 6 7 |
| | 1 / 2 / 1 / 2 | 2 7 2 4 / 1 / 2 4 1 8 / 1 | 1 3 / 2 / 1 / 3 3 / 1 | 2 / 4 / 1 / 2 / 4 / 1 | 1 / 1 |
| Total No. of Injections. | 3 injections. | 16 injections. | 7 injections. | 7 injections. | 1 injection. |
| | Day of lowest P. I. and O. I. same after each. | Day of lowest P. I. and O. I. same after 10 injections.<br>Day of lowest P. I. 1 day earlier after 2 injections<br>Day of lowest P. I. 2 days earlier after 1 injection.<br>Day of lowest P. I. 5 days earlier after 1 injection.<br>Day of lowest P. I. 4 days earlier after 1 injection.<br>Day of lowest P. I. 1 day later after 1 injection. | Day of lowest P. I. and O. I. same after 6 injs.<br>Day of lowest P. I. 3 days earlier after 1 injection. | Day of lowest P. I. and O. I. same after each. | Day of lowest P. I. and O. I. the same. |
| | Day P.I. fell to 1.0 or below. / Day O.I. fell to 1.0 or below. | Day P.I. fell to 1.0 or below. / Day O.I. fell to 1.0 or below. | Day P.I. fell to 1.0 or below. / Day O.I. fell to 1.0 or below. | Day P.I. fell to 1.0 or below. / Day O.I. fell to 1.0 or below. | Day P.I. fell to 1.0 or below. / Day O.I. fell to 1.0 or below. |
| Day Scale. | 4 5 6 7 8 9 10 / 4 5 6 7 8 9 10 | 4 5 6 7 8 9 10 / 4 5 6 7 8 9 10 | 4 5 6 7 8 9 10 / 4 5 6 7 8 9 10 | 3 4 5 6 7 8 9 / 3 4 5 6 7 8 9 | 1 2 3 4 5 6 7 / 1 2 3 4 5 6 7 |
| | 1 / 1 | 4 6 / 3 3 / 2 5 / 2 6 / 1 | 2 4 / 1 / 5 / 1 1 | 4 / 2 / 2 / 4 | 1 / 1 |
| Total No. of Injections. | 1 injection. | 16 injections. | 7 injections. | 6 injections. | 1 injection. |
| | P. I. and O. I. fell to 1.0 or below on same day. | Day P. I. and O. I. fell to 1.0 or below same after 7 injections.<br>P. I. 1 day earlier after 3 injections.<br>P.I. 2 days earlier after 3 injections.<br>P.I. 4 days earlier after 2 injections.<br>P.I. 5 days earlier after 1 injection. | Day P. I. and O. I. fell to 1.0 or below same after 5 injections.<br>P. I. 1 day earlier after 1 injection.<br>P. I. 3 days later after 1 injection. | Day P. I. and O. I. fell to 1.0 or below same after 4 injections.<br>P. I. 3 days earlier after 2 injections. | P. I. and O. I. fell to 1.0 or below on same day. |
| | Day of injection. | Day of injection. | Day of injection. | Day of injection. | Day of injection. |
| Day Scale. | 5 6 7 8 9 10 11 | 5 7 8 11 12 13 | 7 8 10 11 12 13 | 6 7 8 9 10 11 12 | 6 7 8 10 11 |
| | 1 1 2 | 1 1 1 6 / 1 1 | 2 | 1 1 2 | 1 |
| Total No. of Injections. | 3 injections. | 11 injections | 2 injections | 4 injections | 1 injection |

### SUMMARY

Day of highest index.
Total number of injections, 36.
Highest P. I. and O. I. came on same day after 29 injections.
Highest P. I. came 1 day earlier after 4 injections.
Highest P. I. came 1 day later after 1 injection.
Highest P. I. came 4 days earlier after 1 injection.
Highest P. I. came 2 days later after 1 injection.
Highest P.I. and O. I. fell on same day or with only 1 day's difference in 94.4%.
Day of lowest index.
Total number of injections, 34.
Lowest P. I. and O. I. came on same day after 27 injections.
Lowest P. I. came 1 day earlier after 2 injections.
Lowest P. I. came 1 day later after 1 injection.
Lowest P. I. came 2 days earlier after 1 injection.
Lowest P. I. came 3 days earlier after 1 injection.
Lowest P. I. came 4 days earlier after 1 injection.
Lowest P. I. and O. I. came on same day or with 1 day's difference in 88.2%.
Day index fell to 1.0 or below.
Total number of injections, 31.
P. I. and O. I. fell to 1.0 or below on same day after 18 injections.
P. I. fell to 1.0 or below 1 day earlier after 4 injections.
P. I. fell to 1.0 or below 2 days earlier after 3 injections.
P. I. fell to 1.0 or below 3 days earlier after 3 injections.
P. I. fell to 1.0 or below 4 days earlier after 2 injections.
P. I. fell to 1.0 or below 5 days earlier after 1 injection.
P. I. and O. I. fell to 1.0 or below on same day or with 2 day's difference in 80%.

TABLE 7

SHOWING RELATIVE RESULTS FROM GONOCOCCUS VACCINE IN DOSAGE RANGING FROM 2,500,000 TO 20,000,000 GONOCOCCI

| Dosage. | 4 injections. 2,500,000. | | 17 injections. 5 million | | 7 injections. 10 million. | | 6 injections. 15 million. | | 2 injections. 20 million. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Average of highest indices. | | Average of highest indices. | | Average of highest indices. | | Average of highest indices. | | Average of highest indices. | |
| | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. |
| | 1.2 | 1.1 | 1.6 | 1.9 | 1.9 | 2.4 | 1.5 | 1.9 | 1.5 | 1.6 |

| Dosage. | 4 injections. | | 17 injections. | | 7 injections. | | 6 injections. | | 2 injections. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Average day of highest index. | | Average day of highest index. | | Average day of highest index. | | Average day of highest index. | | Average day of highest index. | |
| | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. |
| | 4th. | 4th. | 2nd. | 2nd. | 2nd. | 2nd. | 4th. | 4th. | 3rd. | 3rd. |

| Dosage. | 3 injections. | | 16 injections. | | 7 injections. | | 7 injections. | | 1 injection. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Average day of lowest index. | | Average day of lowest index. | | Average day of lowest index. | | Average day of lowest index. | | Average day of lowest index. | |
| | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. |
| | 3rd. | 3rd. | 7th. | 7th. | 6th | 6th | 6th. | 6th. | 7th. | 7th. |

| Dosage. | 1 injection. | | 17 injections. | | 7 injections. | | 6 injections. | | 1 injection. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Average day index fell to 1.0 or below. | | Average day index fell to 1.0 or below. | | Average day index fell to 1.0 or below. | | Average day index fell to 1.0 or below. | | Average day index fell to 1.0 or below. | |
| | P. I. | O. I. | P. I. | O. I. | P. I. | O I. | P. I. | O. I. | P. I. | O. I. |
| | 4th } only } 1 inj | 4th | 6th. | 7th. | 5th. | 6th. | 4th. | 5th. | 7th } only } 1 inj | 7th. |

| Dosage. | 3 injections. | | 11 injections. | | 7 injections. | | 4 injections. | | 1 injection. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Average day of injection. | | Average day of injection. | | Average day of injection. | | Average day of injection. | | Average day of injection. | |
| | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. |
| | 8th } only } 1 inj | | 9th. | | 9th. | | 10th. | | 10th. | |

## CONCLUSIONS

1. In 300 determinations, the gonococco-opsonic index in normal individuals ranged from .8 to 1.2, with only 18 exceptions. (Table 1.)

2. In one determination each of 51 different normal individuals, the opsonic index ranged from .8 to 1.2, with only two exceptions, one being .7, another 1.4.

3. In 27 cases examined from 2 to 10 times, the diagnosis was positive in 89 per cent.

4. The phagocytic index runs closely parallel to the opsonic index in normal individuals. (Table 1.) This is true in gonorrheal patients before vaccine treatment is begun. (Table 3.)

5. After 36 injections, the phagocytic and opsonic indices reached their highest points on the same day in 94.4 per cent. (Table 6.)

6. The average highest phagocytic index is higher than the average highest opsonic index. (Table 7.)

7. The phagocytic index tends to fall earlier than the opsonic index.

8. Ten million gonococci is the average dose which has raised the opsonic index the most satisfactorily in adults, 4,000,000 to 8,000,000 in children.

9. In a series of 52 gonococcus vaccine injections, only two were followed by a negative phase in the opsonic index. I have seen no clinical negative phase.

10. We cannot yet draw clinical conclusions from the results of gonococcus vaccine.

## VACCINE THERAPY IN TUBERCULOSIS

By Mary C. Lincoln, Ph. B., M. D.

The purpose of the past eight months' work in vaccine therapy in tuberculosis has been:

First, and primarily, to determine the value of the tubercle vaccine in the treatment of tuberculosis;

Second, to determine the reliability of the opsonic index in diagnosis;

Third, to learn whether the opsonic index is the real guide in administering the vaccine;

Fourth, to test the accuracy of the technic in opsonic index estimation.

With a view to obtaining as much data as possible in answering these questions, we have endeavored to treat as many patients as was consistent with careful work, and to make as frequent opsonic index examinations as possible. 180 different individuals have been examined, of whom 40 were cases treated, 35 were for diagnosis, and 105 normals. A total of 2157 opsonic index estimations have been made, consisting of 449 of normal individuals, 130 of diagnosis cases, and 1578 of patients treated. Between 50 and 100 opsonic index determinations have been made of five normal individuals, and single examinations of 100 other normals.

### OPSONIC INDEX THE REAL GUIDE IN THE ADMINISTRATION OF VACCINE

The tables 1–26, compiled from the record cards of the patients, give for each patient the number of injections, with the number of days between each injection, the number of opsonic examinations, the highest opsonic index reached after each injection with the day upon which this occurred, and finally what the opsonic index was previous to each vaccine injection.

Only those patients were selected who were treated for a period long enough to draw conclusions. A study of Table 27 will show that there is no marked variation among the patients; in other words, that each patient is not a law unto himself as to the average number of days between injections, the average highest opsonic index after injections, nor as to the average opsonic index previous to each injection. Hence we may determine from the above 26 patients the following averages:

The average number of days between injections is 7.2.

The average of the highest opsonic indices is 1.3.

The highest opsonic index occurs on the average on the 3.6 day.

The average of the opsonic indices previous to each injection is 1.0.

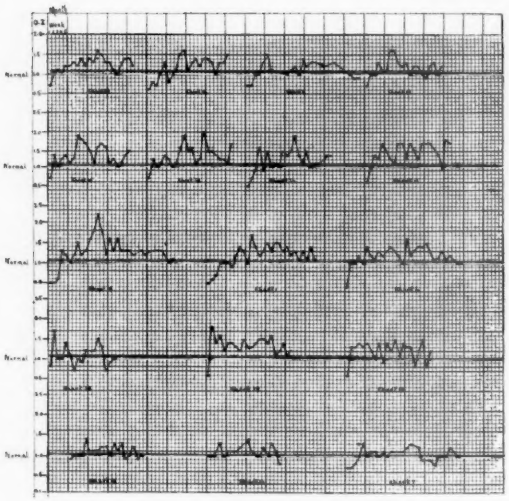
Such a comparison has a certain value in establishing a standard upon which to base the vaccine therapy, but taken alone it will give an erroneous idea of uniformity of treatment of patients. A study of Tables 1 to 26 of the individual patients will show that while there is a tendency toward similarity in reaction and in the time of the vaccine injection during the course of the treatment of a patient and of the different patients, there is too much variation

TABLE 1

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 7. Mrs. S. Urinary Tract Tuberculosis

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 9 | 3 | 0.7 | 7 | 0.6 | 0.5 |
| 2 | 4 | 5 | 0.0 | 3 | 0.5 | 0.7 |
| 3 | 6 | 4 | 1.0 | 1 | 0.7 | 0.6 |
| 4 | 4 | 3 | 1.4 | 1 | 1.3 | 0.6 |
| 5 | 5 | 5 | 1.2 | 2 | 1.0 | 1.2 |
| 6 | 9 | 4 | 1.2 | 3 | 1.0 | 0.9 |
| 7 | 6 | 2 | 1.1 | 2 | 0.9 | 0.8 |
| 8 | 5 | 2 | 1.1 | 6 | 1.1 | 0.8 |
| 9 | 6 | 2 | 1.8 | 4 | 1.3 | 1.1 |
| 10 | 5 | 2 | 1.9 | 1 | 1.5 | 1.8 |
| 11 | 5 | 2 | 1.4 | 1 | 1.3 | 1.0 |
| 12 | 7 | 3 | 1.4 | 2 | 1.0 | 1.1 |
| 13 | 5 | 3 | 1.5 | 2 | 1.3 | 0.8 |
| 14 | 6 | 6 | 2.1 | 1 | 1.6 | 1.1 |
| 15 | 6 | 5 | 1.5 | 1 | 1.1 | 1.0 |
| 16 | 4 | 3 | 1.6 | 1 | 1.4 | 0.8 |
| 17 | 6 | 3 | 2.1 | 4 | 1.4 | 1.0 |
| 18 | 6 | 4 | 2.0 | 3 | 1.6 | 2.1 |
| 19 | 6 | 5 | 1.8 | 2 | 1.4 | 1.5 |
| 20 | 8 | 6 | 1.4 | 1 | 1.2 | 1.3 |
| 21 | 6 | 4 | 1.6 | 4 | 1.3 | 1.1 |
| 22 | 7 | 5 | 2.5 | 1 | 1.4 | 1.3 |
| 23 | 5 | 3 | 1.5 | 3 | 1.1 | 0.9 |
| 24 | 5 | 3 | 1.6 | 1 | 1.5 | 0.9 |
| 25 | 9 | 6 | 1.8 | 5 | 1.5 | 1.3 |
| 26 | 7 | 4 | 1.8 | 2 | 1.5 | 1.0 |
| 27 | 4 | 4 | 1.5 | 3 | 1.3 | 1.2 |
| 28 | 4 | 3 | 1.2 | 4 | 1.1 | 1.1 |
| 30 | 6 | 3 | 2.0 | 2 | 1.4 | 1.2 |
| 31 | 7 | 5 | 1.5 | 3 | 1.3 | 1.0 |
| 32 | 17 | 13 | 1.6 | 9 | 1.2 | 1.1 |
| 33 | 9 | 3 | 1.3 | 6 | 1.1 | 0.9 |
| 34 | 17 | 4 | 1.4 | 5 | 1.2 | 1.2 |
| 35 | 15 | 2 | 1.5 | 11 | 1.3 | 0.9 |



CHARTS OF WEEKLY AVERAGE OPSONIC INDEX

Fig. 50. The first 8 charts illustrate step-like rise of opsonic index to the maximum at the 2nd or 3rd month. The charts in the third row illustrate weekly average of daily opsonic indices. The charts in the fourth row illustrate the rapid rise of the opsonic index to the maximum. The charts in the last row illustrate the low maximum and the small range of the opsonic index.

TABLE 2

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 1. Mr. B. Cervical Pott's Disease. Pulmonary Tuberculosis

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 5 | 3 | 0.8 | 5 | 0.6 | 0.5 |
| 2 | 4 | 4 | 1.2 | 1 | 0.8 | 0.8 |
| 3 | 6 | 3 | 0.8 | 1 | 0.8 | 0.7 |
| 4 | 4 | 3 | 1.5 | 1 | 1.3 | 0.8 |
| 5 | 9 | 8 | 1.7 | 1 | 1.1 | 1.0 |
| 6 | 10 | 3 | 1.2 | 2 | 1.1 | 0.9 |
| 7 | 5 | 2 | 1.0 | 2 | 0.0 | 1.1 |
| 8 | 6 | 2 | 1.0 | 1 | 1.0 | 1.0 |
| 9 | 5 | 2 | 2.0 | 1 | 1.6 | 2.0 |
| 10 | 8 | 3 | 1.2 | 1 | 0.9 | 1.2 |
| 11 | 0 | 3 | 1.8 | 1 | 1.4 | 0.8 |
| 12 | 6 | 3 | 1.4 | 3 | 1.2 | 1.1 |
| 13 | 6 | 3 | 1.3 | 1 | 1.0 | 1.2 |
| 14 | 5 | 3 | 1.3 | 5 | 1.1 | 0.8 |
| 15 | 20 | 4 | 2.3 | 1 | 1.4 | 1.3 |
| 16 | 5 | 2 | 1.0 | 2 | 0.8 | 1.5 |
| 17 | 7 | 1 | 0.9 | 2 | 0.9 | 0.8 |
| 18 | 5 | 1 | 1.1 | 3 | 1.1 | 0.9 |
| 19 | 7 | 1 | 1.3 | 3 | 1.3 | 1.1 |
| 20 | 13 | 1 | 1.2 | 3 | 1.2 | 1.3 |
| 21 | 7 | 0 | ... | .. | ... | ... |
| 22 | 20 | 2 | 1.0 | 6 | 0.9 | 0.8 |
| 23 | 6 | 4 | 1.6 | 2 | 1.2 | 0.9 |
| 24 | 7 | 2 | 0.8 | 4 | 0.8 | 0.8 |
| 25 | 7 | 2 | 1.6 | 5 | 1.3 | 1.6 |
| 26 | 7 | 3 | 1.6 | 5 | 1.3 | 1.6 |
| 27 | 6 | 0 | ... | .. | ... | ... |
| 28 | 7 | 4 | 1.6 | 4 | 1.2 | 1.2 |

to warrant dependence on any such standard. This is brought out in a striking way by Table 28, which shows the extremes of intervals between injections. From our examinations of opsonic indices, we have found it impossible to establish a standard interval between injections. We can, however, conclude from our data, that it is possible to maintain the index at or above normal, if the vaccine is given

TABLE 3

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 2. Mrs. E. Tuberculosis of Left Kidney. Persistent Sinus following

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 6 | 3 | 0.7 | 1 | 0.7 | 0.7 |
| 2 | 4 | 4 | 0.8 | 2 | 0.6 | 0.6 |
| 3 | 7 | 4 | 1.3 | 7 | 0.9 | 0.6 |
| 4 | 4 | 3 | 1.2 | 1 | 1.1 | 1.3 |
| 5 | 3 | 3 | 0.9 | 2 | 0.9 | 1.0 |
| 6 | 6 | 4 | 1.4 | 3 | 1.1 | 0.9 |
| 7 | 8 | 3 | 1.6 | 4 | 1.5 | 0.9 |
| 8 | 6 | 3 | 1.8 | 3 | 1.4 | 1.4 |
| 9 | 28 | 4 | 1.4 | 1 | 1.0 | 1.0 |
| 10 | 5 | 3 | 1.3 | 1 | 1.0 | 0.8 |
| 11 | 6 | 3 | 1.5 | 1 | 1.2 | 0.9 |
| 12 | 4 | 1 | 0.8 | 1 | 0.8 | 0.9 |
| 13 | 3 | 1 | 1.1 | 2 | 1.1 | 0.8 |
| 14 | 4 | 1 | 1.1 | 2 | 1.1 | 1.1 |
| 15 | 5 | 2 | 1.4 | 3 | 1.1 | 1.1 |
| 16 | 5 | 1 | 1.2 | 3 | 1.2 | 0.7 |
| 17 | 8 | 3 | 1.6 | 3 | 1.4 | 1.2 |
| 18 | 10 | 3 | 1.5 | 2 | 1.3 | 1.1 |

TABLE 4

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 5. Miss M. Cervical Pott's Disease. Subdiaphragmatic Abscess with Fistula

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 6 | 5 | 0.8 | 2 | 0.6 | 0.7 |
| 2 | 4 | 4 | 0.7 | 2 | 0.5 | 0.6 |
| 3 | 6 | 5 | 1.0 | 1 | 0.7 | 0.6 |
| 4 | 4 | 2 | 2.4 | 1 | 1.6 | 0.6 |
| 5 | 9 | 8 | 1.8 | 3 | 1.0 | 1.7 |
| 6 | 10 | 7 | 2.0 | 1 | 1.2 | 1.0 |
| 7 | 5 | 2 | 1.1 | 1 | 1.1 | 0.9 |
| 8 | 6 | 2 | 1.4 | 4 | 1.3 | 1.1 |
| 9 | 5 | 2 | 2.4 | 1 | 1.6 | 1.4 |
| 10 | 5 | 2 | 1.2 | 1 | 1.1 | 0.8 |
| 11 | 7 | 5 | 1.6 | 1 | 1.2 | 1.0 |
| 12 | 5 | 3 | 1.5 | 2 | 1.1 | 0.9 |
| 13 | 5 | 4 | 2.4 | 1 | 1.6 | 1.1 |
| 14 | 6 | 5 | 2.5 | 1 | 1.7 | 1.0 |
| 15 | 7 | 5 | 2.3 | 2 | 1.8 | 2.0 |
| 16 | 15 | 11 | 2.5 | 5 | 2.0 | 1.4 |
| 17 | 3 | 3 | 1.6 | 1 | 1.1 | 0.7 |
| 18 | 21 | 15 | 2.0 | 12 | 1.5 | 0.9 |
| 19 | 87 | 15 | 1.7 | 25 | 1.3 | 0.9 |
| 20 | 4 | 2 | 1.1 | 2 | 1.0 | 0.8 |
| 21 | 10 | 8 | 1.5 | 3 | 1.1 | 0.7 |
| 22 | 4 | 3 | 1.5 | 1 | 1.1 | 0.9 |

when the opsonic index has dropped on the average to 1.0. That is not our only guide. The degree of reaction, that is, what the maximum index was, how soon it appeared after the injection, and whether there was a gradual or a sudden drop to normal or below, are additional aids in determining the dosage, and the time of administering the vaccine.

We may learn also from our tables when to make opsonic examinations and how many are necessary. In three of our cases daily examinations were made for several months

TABLE 5

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 6. Miss B. Osteitis of Tarsal and Metatarsal Bones of Right Foot

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 4 | 5 | 0.7 | 2 | 0.5 | 0.6 |
| 2 | 7 | 5 | 1.4 | 3 | 0.9 | 0.6 |
| 3 | 3 | 1 | 1.3 | 1 | 1.3 | 1.3 |
| 4 | 5 | 4 | 1.0 | 2 | 0.9 | 0.8 |
| 5 | 4 | 3 | 2.0 | 3 | 1.5 | 0.9 |
| 6 | 10 | 4 | 1.5 | 2 | 1.3 | 1.0 |
| 7 | 5 | 2 | 1.2 | 4 | 1.2 | 1.2 |
| 8 | 6 | 2 | 1.4 | 1 | 1.1 | 0.9 |
| 9 | 5 | 2 | 2.0 | 1 | 1.4 | 0.8 |
| 10 | 8 | 3 | 1.5 | 1 | 1.1 | 0.8 |
| 11 | 4 | 1 | 1.0 | 4 | 1.0 | 1.0 |
| 12 | 6 | 33 | 1.4 | 1 | 1.3 | 1.2 |
| 13 | 5 | 2 | 1.0 | 3 | 1 0 | 0.9 |
| 14 | 5 | 1 | 1.0 | 5 | 1.0 | 1.0 |
| 15 | 4 | 0 | ... | .. | ... | ... |
| 16 | 7 | 0 | ... | .. | ... | ... |
| 17 | 7 | 1 | 0.8 | 7 | 0.8 | 0.8 |
| 18 | 6 | 1 | 1.4 | 2 | 1.4 | 1.4 |
| 19 | 7 | 2 | 1.2 | 4 | 1.1 | 0.9 |
| 20 | 8 | 1 | 1.1 | 3 | 1.1 | 1.1 |

TABLE 6

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 3. Mr. L. Lumbar Pott's Disease. Empyema. Double Psoas Abscess.

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 6 | 4 | 1.2 | 1 | 1.0 | 0.6 |
| 2 | 4 | 3 | 1.2 | 1 | 1.0 | 1.0 |
| 3 | 5 | 5 | 1.2 | 2 | 0.9 | 0.8 |
| 4 | 4 | 3 | 1.4 | 1 | 1.0 | 0.7 |
| 5 | 10 | 4 | 1.8 | 1 | 1.2 | 0.8 |
| 6 | 5 | 2 | 1.4 | 2 | 1.4 | 1.4 |
| 7 | 6 | 2 | 1.4 | 4 | 1.2 | 1.4 |
| 8 | 5 | 2 | 1.0 | 1 | 1.0 | 1.0 |
| 9 | 5 | 2 | 1.2 | 2 | 1.1 | 1.2 |
| 10 | 7 | 3 | 1.5 | 2 | 1.2 | 1.1 |
| 11 | 5 | 2 | 1.5 | 2 | 1.3 | 1.1 |
| 12 | 6 | 3 | 1.6 | 2 | 1.3 | 1.0 |
| 13 | 6 | 3 | 1.9 | 1 | 1.4 | 1.1 |
| 14 | 4 | 3 | 1.3 | 1 | 1.1 | 1.0 |
| 15 | 5 | 2 | 2.5 | 2 | 1.6 | 0.8 |
| 16 | 6 | 2 | 1.4 | 6 | 1.2 | 1.4 |
| 17 | 7 | 1 | 1.0 | 7 | 1.0 | 1.0 |
| 18 | 8 | 4 | 2.0 | 1 | 1.5 | 1.0 |
| 19 | 6 | 2 | 1.3 | 4 | 1.2 | 1.5 |
| 20 | 7 | 4 | 1.4 | 6 | 1.3 | 1.1 |
| 21 | 5 | 3 | 1.6 | 2 | 1.2 | 1.1 |
| 22 | 5 | 4 | 2.0 | 1 | 1.4 | 1.2 |
| 23 | 6 | 4 | 1.8 | 4 | 1.4 | 0.9 |
| 24 | 10 | 6 | 2.6 | 1 | 1.6 | 1.0 |
| 25 | 4 | 4 | 2.5 | 1 | 1.7 | 1.0 |
| 26 | 4 | 2 | 0.8 | 1 | 0.8 | 0.7 |
| 27 | 9 | 5 | 1.5 | 6 | 1.2 | 1.2 |
| 28 | 6 | 4 | 1.7 | 2 | 1.4 | 1.1 |
| 29 | 26 | 16 | 1.9 | 20 | 1.3 | 0.8 |
| 30 | 17 | 9 | 1.6 | 15 | 1.5 | 0.9 |
| 31 | 12 | 3 | 1.5 | 6 | 1.2 | 1.2 |

TABLE 7

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS.

Case 13. Mr. F. Tuberculosis of Elbow

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 5 | 5 | 0.8 | 1 | 0.7 | 0.8 |
| 2 | 14 | 6 | 1.1 | 9 | 0.7 | 1.1 |
| 3 | 5 | 2 | 1.5 | 3 | 1.1 | 1.0 |
| 4 | 8 | 4 | 1.4 | 2 | 1.1 | 1.0 |
| 5 | 7 | 3 | 1.0 | 1 | 1.0 | 1.0 |
| 6 | 5 | 3 | 1.2 | 3 | 1.1 | 1.2 |
| 7 | 5 | 3 | 1.0 | 3 | 1.0 | 1.0 |
| 8 | 4 | 3 | 1.1 | 1 | 0.9 | 0.8 |
| 9 | 5 | 3 | 1.2 | 1 | 1.1 | 0.9 |
| 10 | 4 | 3 | 1.4 | 1 | 1.1 | 0.8 |
| 11 | 4 | 2 | 1.3 | 1 | 1.3 | 1.2 |
| 12 | 5 | 3 | 1.1 | 4 | 1.0 | 0.9 |
| 13 | 5 | 1 | 0.7 | 3 | 0.7 | 0.7 |
| 14 | 5 | 2 | 1.2 | 1 | 1.1 | 1.0 |
| 15 | 6 | 1 | 1.1 | 3 | 1.1 | 1.0 |
| 16 | 5 | 1 | 1.2 | 2 | 1.2 | 1.2 |
| 17 | 5 | 2 | 1.0 | 3 | 1.0 | 1.0 |
| 18 | 5 | 2 | 1.3 | 4 | 1.1 | 1.3 |
| 19 | 5 | 2 | 0.9 | 3 | 0.9 | 0.8 |
| 20 | 7 | 2 | 1.0 | 6 | 1.0 | 1.0 |
| 21 | 5 | 2 | 1.4 | 3 | 1.3 | 1.2 |
| 22 | 5 | 2 | 1.5 | 3 | 1.3 | 1.1 |
| 23 | 6 | 2 | 1.3 | 4 | 1.2 | 1.1 |
| 24 | 9 | 1 | 1.2 | 5 | 1.2 | 1.2 |
| 25 | 8 | 2 | 0.9 | 5 | 0.9 | 0.9 |
| 26 | 10 | 1 | 0.8 | 5 | 0.8 | 0.8 |
| 27 | 18 | 4 | 1.0 | 6 | 1.0 | 1.0 |
| 28 | 10 | 3 | 1.7 | 4 | 1.2 | 1.3 |
| 29 | 14 | 3 | 1.0 | 10 | 0.8 | 0.6 |

TABLE 8

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 9. Baby G. Dorsal Pott's Disease

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 5 | 4 | 1.0 | 1 | 1.0 | 1.0 |
| 2 | 4 | 2 | 1.8 | 3 | 1.3 | 0.8 |
| 3 | 10 | 4 | 1.2 | 2 | 1.1 | 1.0 |
| 4 | 5 | 2 | 1.2 | 2 | 1.2 | 1.1 |
| 5 | 6 | 1 | 1.4 | 4 | 1.4 | 1.4 |
| 6 | 5 | 2 | 1.6 | 1 | 1.2 | 0.7 |
| 7 | 5 | 2 | 1.6 | 1 | 1.4 | 1.2 |
| 8 | 7 | 3 | 1.5 | 4 | 1.1 | 1.0 |
| 9 | 5 | 3 | 1.1 | 4 | 0.9 | 0.8 |
| 10 | 6 | 2 | 2.0 | 1 | 1.5 | 0.9 |
| 11 | 6 | 2 | 2.0 | 1 | 1.7 | 1.4 |
| 12 | 4 | 3 | 1.8 | 1 | 1.2 | 0.8 |
| 13 | 5 | 0 | ... | .. | ... | ... |
| 14 | 7 | 2 | 2.0 | 2 | 1.7 | 1.5 |
| 15 | 6 | 1 | 1.2 | 5 | 1.2 | 1.2 |
| 16 | 7 | 2 | 1.8 | 3 | 1.5 | 1.1 |
| 17 | 7 | 2 | 1.3 | 2 | 1.2 | 1.1 |

to learn something of the blood's actual daily content of opsonins. Figs. 3 and 5, and Tables 1, 4, 6, and Nos. 1, 4, 6, of Table 27, give the data of these three cases. A comparison of these cases and of those with less frequent opsonic examinations shows that the maximum opsonic index occurs on the average between the third and fourth day, and that the opsonic index falls to normal or below, on the average, between the fourth and seventh day.

TABLE 9

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Mr. A. Hip Disease. Pulmonary Tuberculosis

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 5 | 1 | 0.7 | 4 | 0.7 | 0.7 |
| 2 | 4 | 2 | 1.5 | 1 | 1.3 | 1.1 |
| 3 | 5 | 2 | 1.6 | 1 | 1.4 | 1.2 |
| 4 | 5 | 4 | 1.8 | 3 | 1.5 | 1.2 |
| 5 | 4 | 2 | 1.4 | 1 | 1.2 | 1.0 |
| 6 | 3 | 3 | 1.8 | 1 | 1.3 | 1.0 |
| 7 | 4 | 3 | 1.7 | 1 | 1.3 | 1.1 |
| 8 | 6 | 3 | 2.0 | 1 | 1.5 | 1.1 |
| 9 | 12 | 2 | 2.0 | 3 | 1.5 | 2.0 |
| 10 | 7 | 1 | 1.8 | 3 | 1.8 | 1.8 |
| 11 | 7 | 1 | 1.2 | 4 | 1.2 | 1.2 |
| 12 | 5 | 2 | 1.4 | 3 | 1.4 | 1.4 |
| 13 | 5 | 2 | 1.2 | 3 | 1.1 | 1.2 |
| 14 | 4 | 2 | 1.3 | 3 | 1.1 | 1.3 |
| 15 | 12 | 1 | 1.4 | 3 | 1.4 | 1.4 |
| 16 | 7 | 1 | 1.0 | 2 | 1.0 | 1.0 |
| 17 | 6 | 1 | 2.6 | 2 | 2.6 | 2.6 |
| 18 | 10 | 2 | 2.0 | 3 | 1.8 | 2.0 |
| 19 | 22 | 3 | 1.5 | 4 | 1.2 | 0.9 |
| 20 | 6 | 1 | 1.4 | 7 | 1.4 | 1.4 |

TABLE 10

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 4. Mr. B. Tuberculosis of the Elbow

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 11 | 6 | 1.4 | 7 | 1.1 | 1.0 |
| 2 | 5 | 3 | 1.0 | 2 | 0.9 | 0.9 |
| 3 | 4 | 3 | 1.4 | 1 | 1.1 | 0.8 |
| 4 | 5 | 2 | 1.6 | 1 | 1.4 | 1.2 |
| 5 | 5 | 3 | 1.8 | 1 | 1.4 | 1.0 |
| 6 | 4 | 2 | 1.3 | 1 | 1.2 | 1.0 |
| 7 | 14 | 2 | 1.4 | 10 | 1.1 | 0.8 |
| 8 | 4 | 1 | 0.9 | 3 | 0.9 | 0.9 |
| 9 | 6 | 2 | 1.5 | 2 | 1.3 | 1.1 |
| 10 | 5 | 2 | 1.1 | 3 | 1.1 | 1.1 |
| 11 | 6 | 1 | 1.4 | 3 | 1.4 | 1.4 |
| 12 | 8 | 1 | 1.0 | 3 | 1.0 | 1.0 |
| 13 | 9 | 1 | 1.5 | 3 | 1.5 | 1.5 |
| 14 | 7 | 2 | 1.5 | 3 | 1.4 | 1.5 |
| 15 | 6 | 1 | 1.0 | 4 | 1.0 | 1.6 |
| 16 | 9 | 3 | 1 2 | 4 | 1.1 | 1.0 |
| 17 | 5 | 2 | 1.0 | 3 | 0.9 | 0.7 |
| 18 | 16 | 5 | 1.3 | 5 | 1.1 | 0.9 |
| 19 | 9 | 3 | 1.4 | 6 | 1.2 | 1.0 |
| 20 | 10 | 4 | 1.4 | 4 | 1.2 | 1.1 |
| 21 | 10 | 2 | 1.0 | 10 | 0.9 | 1.0 |
| 22 | 8 | 1 | 0.7 | 5 | 0.7 | 0.7 |

We may conclude, then, that at least two blood examinations should be made between injections, one to learn how high the maximum opsonic index rose, and the other to learn when the opsonic index drops to about 1.0. If the opsonic index persists above normal, daily examinations are unnecessary; instead, every two days or less often. Each case must be watched as an individual case.

## CONCLUSIONS TO BE DRAWN FROM CHART CURVES OF OPSONIC INDICES

The range of the opsonic indices and the effect of the vaccine upon the opsonic content of the blood is graphically represented in the chart curves. It is hardly fair to compare curves of daily indices with curves of much less

TABLE 11

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Miss H. Tubercular Peritonitis

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 13 | 3 | 2.0 | 1 | 1.6 | 1.0 |
| 2 | 5 | 2 | 1.8 | 3 | 1.3 | 1.1 |
| 3 | 5 | 1 | 1.4 | 3 | 1.4 | 1.4 |
| 4 | 3 | 1 | 1.1 | 1 | 1.1 | 1.1 |
| 5 | 3 | 2 | 1.6 | 2 | 1.3 | 1.2 |
| 6 | 5 | 0 | ... | .. | ... | ... |
| 7 | 5 | 1 | 0.8 | 3 | 0.8 | 0.8 |
| 8 | 7 | 1 | 1.5 | 3 | 1.5 | 1.5 |
| 9 | 8 | 1 | 1.0 | 3 | 1.0 | 1.0 |
| 10 | 10 | 2 | 1.4 | 5 | 1.2 | 1.4 |

TABLE 12

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 14. Boy P. Pott's Disease

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 6 | 2 | 1.0 | 4 | 0.9 | 1.0 |
| 2 | 4 | 1 | 0.5 | 4 | 0.5 | 0.5 |
| 3 | 5 | 1 | 1.0 | 5 | 1.0 | 1.0 |
| 4 | 5 | 2 | 1.8 | 3 | 1.4 | 1.0 |
| 5 | 4 | 1 | 1.3 | 3 | 1.3 | 1.3 |
| 6 | 5 | 1 | 0.8 | 5 | 0.8 | 0.8 |
| 7 | 5 | 1 | 1.1 | 3 | 1.1 | 1.1 |
| 8 | 4 | 1 | 0.9 | 4 | 0.9 | 0.9 |
| 9 | 5 | 1 | 1.1 | 4 | 1.1 | 1.1 |
| 10 | 6 | 3 | 1.9 | 6 | 1.6 | 1.8 |
| 11 | 6 | 2 | 1.4 | 4 | 1.4 | 1.4 |
| 12 | 7 | 3 | 2.1 | 3 | 1.5 | 1.1 |
| 13 | 4 | 2 | 1.4 | 3 | 1.2 | 0.9 |
| 14 | 5 | 3 | 1.5 | 5 | 1.3 | 1.5 |
| 15 | 7 | 3 | 2.2 | 3 | 1.7 | 1.2 |
| 16 | 7 | 4 | 1.3 | 5 | 1.2 | 1.2 |
| 17 | 5 | 4 | 1.5 | 3 | 1.2 | 1.3 |
| 18 | 7 | 4 | 1.7 | 1 | 1.4 | 1.4 |
| 19 | 16 | 5 | 1.6 | 3 | 1.3 | 1.0 |
| 20 | 5 | 2 | 1.6 | 3 | 1.3 | 1.0 |

frequent indices, but conclusions may be drawn from comparison of curves of daily indices, or from comparison of curves of indices of similar intervals. Figs. 3, 5, 7 illustrate curves of daily indices. Figs. 14, 15, 16, 17, 18 illustrate curves of less frequent indices.

The charts of curves of each opsonic index demonstrate the following points:

1. There is, with very few exceptions, a rise in the opsonic index after each injection of vaccine, that is, there are very few negative phases.

2. With one exception, there are no two successive maximal rises in the opsonic index after the injections.

3. There is a tendency toward a monthly maximal opsonic index. (See Fig. 50, page 416).

The charts of the curves of the weekly average opsonic index accentuate some of the features merely indicated in the daily curves.

1. There is a step-like rise of the index to

TABLE 13

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 15. Boy B. Hip Disease

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 6 | 2 | 1.2 | 3 | 1.1 | 2.0 |
| 2 | 4 | 1 | 1.0 | 4 | 1.0 | 1.0 |
| 3 | 6 | 1 | 1.1 | 3 | 1.1 | 1.1 |
| 4 | 4 | 2 | 1.5 | 3 | 1.5 | 1.5 |
| 5 | 4 | 1 | 1.1 | 3 | 1.1 | 1.1 |
| 6 | 5 | 1 | 1.2 | 5 | 1.2 | 1.2 |
| 7 | 5 | 1 | 1.0 | 4 | 1.0 | 1.0 |
| 8 | 4 | 1 | 0.9 | 4 | 0.9 | 0.9 |
| 9 | 5 | 1 | 1.1 | 4 | 1.1 | 1.1 |
| 10 | 9 | 1 | 1.8 | 5 | 1.8 | 1.8 |
| 11 | 6 | 2 | 1.9 | 4 | 1.8 | 1.9 |
| 12 | 4 | 2 | 2.4 | 3 | 1.8 | 1.1 |
| 13 | 5 | 2 | 1.7 | 3 | 2.0 | 1.2 |
| 14 | 5 | 2 | 2.0 | 3 | 1.5 | 1.0 |
| 15 | 7 | 2 | 1.5 | 5 | 1.3 | 1.0 |
| 16 | 4 | 1 | 0.8 | 4 | 0.8 | 0.8 |
| 17 | 5 | 2 | 1.5 | 4 | 1.3 | 1.0 |
| 18 | 10 | 5 | 2.3 | 6 | 1.6 | 1.0 |
| 19 | 23 | 5 | 1.7 | 4 | 1.4 | 1.0 |
| 20 | 0 | 3 | 1.7 | 7 | 1.2 | 1.0 |
| 21 | 10 | 2 | 1.2 | 7 | 1.1 | 1.2 |

TABLE 14

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 18. Boy O. Hip Disease

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 6 | 1 | 1.8 | 3 | 1.8 | 1.8 |
| 2 | 4 | 1 | 1.4 | 4 | 1.4 | 1.4 |
| 3 | 5 | 1 | 1.6 | 3 | 1.6 | 1.6 |
| 4 | 5 | 2 | 1.5 | 5 | 1.3 | 1.5 |
| 5 | 4 | 1 | 1.0 | 3 | 1.0 | 1.0 |
| 6 | 5 | 1 | 1.4 | 5 | 1.4 | 1.4 |
| 7 | 5 | 1 | 1.4 | 4 | 1.4 | 1.4 |
| 8 | 4 | 1 | 1.5 | 4 | 1.5 | 1.5 |
| 9 | 5 | 1 | 1.3 | 4 | 1.3 | 1.3 |
| 10 | 6 | 1 | 1.0 | 5 | 1.0 | 1.0 |
| 11 | 6 | 2 | 1.7 | 4 | 1.6 | 1.7 |
| 12 | 7 | 3 | 1.7 | 4 | 1.3 | 1.1 |
| 13 | 5 | 3 | 1.6 | 4 | 1.3 | 1.1 |
| 14 | 4 | 2 | 1.6 | 3 | 1.3 | 1.1 |
| 15 | 7 | 3 | 2.0 | 5 | 1.4 | 1.0 |
| 16 | 5 | 2 | 1.5 | 3 | 1.1 | 0.7 |
| 17 | 5 | 4 | 2.5 | 3 | 1.3 | 1.3 |
| 18 | 11 | 7 | 2.0 | 9 | 1.4 | 1.3 |
| 19 | 14 | 6 | 2.0 | 3 | 1.5 | 1.6 |
| 20 | 7 | 1 | 0.7 | 5 | 0.7 | 0.7 |
| 21 | 12 | 5 | 1.5 | 8 | 1.3 | 1.1 |
| 22 | 9 | 3 | 1.3 | 5 | 1.2 | 1.1 |

TABLE 15

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 21. Girl K. Hip Disease

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 6 | 1 | 1.3 | 3 | 1.3 | 1.3 |
| 2 | 4 | 1 | 1.0 | 4 | 1.0 | 1.0 |
| 3 | 5 | 1 | 1.2 | 5 | 1.2 | 1.2 |
| 4 | 5 | 2 | 1.7 | 3 | 1.5 | 1.3 |
| 5 | 4 | 1 | 0.0 | 3 | 0.9 | 0.9 |
| 6 | 5 | 1 | 1.1 | 5 | 1.1 | 1.1 |
| 7 | 5 | 1 | 1.0 | 4 | 1.0 | 1.0 |
| 8 | 4 | 1 | 1.3 | 4 | 1.3 | 1.3 |
| 9 | 5 | 1 | 1.8 | 4 | 1.8 | 1.8 |
| 10 | 6 | 1 | 1.8 | 5 | 1.8 | 1.8 |
| 11 | 6 | 2 | 1.4 | 2 | 1.3 | 1.2 |
| 12 | 4 | 2 | 2.1 | 3 | 1.0 | 1.0 |
| 13 | 5 | 2 | 1.7 | 3 | 1.5 | 1.2 |
| 14 | 6 | 2 | 1.1 | 3 | 1.1 | 1.0 |
| 15 | 8 | 3 | 1.8 | 6 | 1.5 | 1.0 |
| 16 | 12 | 6 | 2.5 | 8 | 1.7 | 1.1 |
| 17 | 7 | 4 | 1.8 | 1 | 1.4 | 1.1 |
| 18 | 16 | 4 | 1.2 | 7 | 1.2 | 1.0 |
| 20 | 7 | 3 | 1.2 | 3 | 1.1 | 1.0 |
| 21 | 17 | 6 | 1.5 | 5 | 1.4 | 1.3 |

TABLE 16

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 24. Boy S. Hip Disease

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 6 | 2 | 1.0 | 3 | 0.7 | 0.4 |
| 2 | 4 | 1 | 1.2 | 4 | 1.2 | 1.2 |
| 3 | 5 | 2 | 1.9 | 3 | 1.5 | 1.0 |
| 4 | 4 | 1 | 0.9 | 3 | 0.9 | 0.9 |
| 5 | 5 | 1 | 1.2 | 5 | 1.2 | 1.2 |
| 6 | 5 | 1 | 1.6 | 4 | 1.6 | 1.6 |
| 7 | 4 | 1 | 1.0 | 4 | 1.0 | 1.0 |
| 8 | 5 | 1 | 1.1 | 4 | 1.1 | 1.1 |
| 9 | 6 | 1 | 1.1 | 5 | 1.1 | 1.1 |
| 10 | 6 | 2 | 1.0 | 2 | 1.0 | 0.9 |
| 11 | 7 | 3 | 1.8 | 3 | 1.4 | 0.9 |
| 12 | 5 | 3 | 1.5 | 5 | 1.3 | 1.5 |
| 13 | 4 | 1 | 0.9 | 3 | 0.9 | 0.9 |
| 14 | 7 | 1 | 1.8 | 5 | 1.8 | 1.8 |
| 15 | 5 | 2 | 2.5 | 3 | 1.8 | 1.1 |
| 16 | 5 | 3 | 1.7 | 1 | 1.2 | 1.2 |
| 17 | 9 | 4 | 1.3 | 2 | 1.2 | 0.9 |
| 18 | 16 | 3 | 1.4 | 7 | 1.1 | 1.0 |
| 19 | 7 | 2 | 1.3 | 3 | 1.2 | 1.1 |
| 20 | 21 | 9 | 1.9 | 7 | 1.2 | 0.8 |

the second and third month when the maximum is reached, to be followed by a drop to a lower average maintained above normal.

2. There is an individuality about chart curves as to the maximum index.

3. There are classes of cases that show a rapid rise to the maximum index.

4. There are classes of cases that show a low maximum and small range of the opsonic index.

TABLE 17

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 17. Girl R. Pott's Disease

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 6 | 2 | 1.0 | 3 | 1.0 | 1.0 |
| 2 | 4 | 1 | 1.6 | 4 | 1.6 | 1.6 |
| 3 | 5 | 1 | 1.2 | 3 | 1.2 | 1.2 |
| 4 | 5 | 2 | 2.4 | 3 | 1.8 | 1.2 |
| 5 | 4 | 1 | 1.1 | 4 | 1.1 | 1.1 |
| 6 | 5 | 1 | 1.4 | 5 | 1.4 | 1.4 |
| 7 | 5 | 3 | 1.1 | 4 | 1.1 | 1.1 |
| 8 | 4 | 1 | 1.3 | 4 | 1.3 | 1.3 |
| 9 | 5 | 1 | 1.1 | 4 | 1.1 | 1.1 |
| 10 | 6 | 1 | 1.3 | 5 | 1.3 | 1.3 |
| 11 | 6 | 2 | 2.5 | 2 | 1.8 | 1.1 |
| 12 | 7 | 2 | 2.0 | 3 | 1.5 | 1.0 |
| 13 | 4 | 2 | 1.6 | 3 | 1.4 | 1.1 |
| 14 | 10 | 7 | 1.8 | 5 | 1.6 | 1.4 |
| 15 | 4 | 1 | 1.0 | 4 | 1.0 | 1.0 |
| 16 | 3 | 1 | 0.8 | 3 | 0.8 | 0.8 |
| 17 | 12 | 8 | 1.8 | 5 | 1.5 | 1.1 |
| 18 | 23 | 5 | 2.2 | 3 | 1.6 | 1.2 |
| 19 | 9 | 3 | 1.1 | 5 | 1.0 | 1.0 |

TABLE 18

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 16. Boy B. Pott's Disease

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 6 | 2 | 1.5 | 3 | 1.3 | 1.0 |
| 2 | 4 | 1 | 1.5 | 4 | 1.5 | 1.5 |
| 3 | 5 | 1 | 1.4 | 3 | 1.4 | 1.4 |
| 4 | 4 | 2 | 1.7 | 3 | 1.5 | 1.3 |
| 5 | 4 | 1 | 1.2 | 3 | 1.2 | 1.2 |
| 6 | 5 | 1 | 1.4 | 5 | 1.4 | 1.4 |
| 7 | 5 | 1 | 0.9 | 4 | 0.9 | 0.9 |
| 8 | 4 | 1 | 1.3 | 4 | 1.3 | 1.3 |
| 9 | 5 | 1 | 1.0 | 4 | 1.0 | 1.0 |
| 10 | 6 | 2 | 1.3 | 5 | 1.2 | 1.0 |
| 11 | 6 | 2 | 1.4 | 2 | 1.4 | 1.4 |
| 12 | 4 | 2 | 1.0 | 3 | 0.7 | 0.5 |
| 13 | 5 | 2 | 1.6 | 3 | 1.4 | 1.2 |
| 14 | 5 | 2 | 1.3 | 3 | 1.2 | 1.0 |
| 15 | 7 | 2 | 2.2 | 5 | 1.6 | 1.0 |
| 16 | 5 | 2 | 1.4 | 5 | 1.0 | 1.2 |
| 17 | 4 | 3 | 1.3 | 2 | 1.2 | 1.2 |
| 18 | 10 | 6 | 1.6 | 6 | 1.2 | 0.9 |
| 19 | 4 | 2 | 1.3 | 3 | 1.3 | 1.2 |
| 20 | 14 | 5 | 1.4 | 9 | 1.2 | 0.8 |
| 21 | 7 | 2 | 1.4 | 3 | 1.2 | 1.0 |
| 22 | 12 | 5 | 2.0 | 5 | 1.4 | 0.8 |
| 23 | 0 | 3 | 1.3 | 4 | 1.2 | 1.0 |

VALUE OF THE OPSONIC INDEX IN DIAGNOSIS

1. *Is there a normal tuberculo-opsonic index?*

In answer to this first question five different individuals absolutely free from tubercular infection, as far as known, were selected as normals, and their tuberculo-indices were determined 50 to 100 times during the course of six months. Table 29 (a) gives the results of these examinations.

TABLE 19

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 19. Mr. F. Tuberculosis of the Foot

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 4 | 3 | 1.6 | 1 | 1.1 | 1.0 |
| 2 | 5 | 3 | 1.0 | 4 | 0.7 | 1.0 |
| 3 | 5 | 1 | 0.9 | 3 | 0.9 | 0.9 |
| 4 | 5 | 1 | 1.2 | 3 | 1.2 | 1.2 |
| 5 | 5 | 2 | 1.4 | 3 | 1.3 | 1.2 |
| 6 | 5 | 1 | 1.0 | 3 | 1.0 | 1.0 |
| 7 | 6 | 2 | 1.2 | 3 | 1.2 | 1.1 |
| 8 | 9 | 2 | 1.1 | 3 | 1.1 | 1.0 |
| 9 | 9 | 1 | 1.5 | 5 | 1.5 | 1.5 |
| 10 | 7 | 5 | 1.7 | 1 | 1.4 | 1.2 |
| 11 | 7 | 2 | 1.3 | 3 | 1.2 | 1.1 |
| 12 | 5 | 1 | 1.4 | 4 | 1.4 | 1.4 |
| 13 | 8 | 4 | 1.6 | 7 | 1.3 | 1.0 |
| 14 | 7 | 1 | 0.5 | 4 | 0.5 | 0.5 |
| 15 | 9 | 3 | 1.4 | 3 | 1.1 | 0.9 |
| 16 | 12 | 6 | 1.4 | 6 | 1.2 | 1.0 |
| 17 | 7 | 1 | 0.9 | 5 | 0.9 | 0.9 |
| 18 | 12 | 3 | 1.0 | 4 | 0.9 | 0.8 |
| 19 | 0 | 3 | 1.4 | 4 | 1.2 | 0.9 |
| 20 | 7 | 2 | 1.5 | 4 | 1.3 | 1.5 |
| 21 | 13 | 9 | 1.5 | 10 | 1.1 | 1.1 |

TABLE 20

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 22. Girl L. Pott's Disease

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 6 | 2 | 1.2 | 4 | 1.1 | 1.2 |
| 2 | 4 | 1 | 1.0 | 4 | 1.0 | 1.0 |
| 3 | 5 | 1 | 1.0 | 3 | 1.0 | 1.0 |
| 4 | 5 | 2 | 1.7 | 3 | 1.3 | 1.0 |
| 5 | 4 | 1 | 1.0 | 3 | 1.0 | 1.0 |
| 6 | 5 | 1 | 1.2 | 5 | 1.2 | 1.2 |
| 7 | 5 | 1 | 1.4 | 4 | 1.4 | 1.4 |
| 8 | 6 | 1 | 1.2 | 6 | 1.2 | 1.2 |
| 9 | 5 | 1 | 1.2 | 4 | 1.2 | 1.2 |
| 10 | 6 | 1 | 1.2 | 5 | 1.2 | 1.2 |
| 11 | 6 | 2 | 1.5 | 2 | 1.5 | 1.4 |
| 12 | 7 | 2 | 1.5 | 5 | 1.3 | 1.5 |
| 13 | 5 | 3 | 1.4 | 3 | 1.3 | 1.1 |
| 14 | 4 | 2 | 1.4 | 3 | 1.3 | 1.1 |
| 15 | 7 | 2 | 1.6 | 5 | 1.6 | 1.5 |
| 16 | 5 | 1 | 1.2 | 3 | 1.2 | 1.2 |
| 17 | 5 | 5 | 1.5 | 2 | 1.2 | 0.9 |
| 18 | 7 | 4 | 1.7 | 3 | 1.3 | 0.9 |
| 19 | 18 | 6 | 1.8 | 3 | 1.3 | 1.0 |
| 20 | 7 | 2 | 1.4 | 3 | 1.3 | 1.1 |
| 21 | 20 | 6 | 1.8 | 12 | 1.3 | 1.0 |

It will be seen that in the total of 350 opsonic indices the range of the indices, with few exceptions, is 0.8 to 1.2, and the average of any group of three or five of these indices is never below 0.9 or over 1.2. Inasmuch as the exceptions were so very few in number, fourteen as compared with a total of 350, it is probable that these small variations from the range were due to errors in technic.

To furnish additional data in establishing a normal tuberculo-opsonic index, single examinations were made of 100 different persons believed to be normal. These persons con-

TABLE 21

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 23. Girl G. Hip Disease

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O.I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 5 | 2 | 0.9 | 3 | 0.8 | 0.9 |
| 2 | 6 | 2 | 1.0 | 3 | 0.9 | 0.8 |
| 3 | 7 | 2 | 1.1 | 1 | 1.0 | 1.0 |
| 4 | 5 | 1 | 1.5 | 4 | 1.5 | 1.5 |
| 5 | 4 | 1 | 1.3 | 4 | 1.3 | 1.3 |
| 6 | 5 | 1 | 1.1 | 4 | 1.1 | 1.1 |
| 7 | 6 | 1 | 1.4 | 5 | 1.4 | 1.4 |
| 8 | 6 | 2 | 1.1 | 4 | 1.0 | 1.1 |
| 9 | 7 | 3 | 1.8 | 3 | 1.0 | 0.7 |
| 10 | 5 | 3 | 1.4 | 3 | 1.2 | 0.8 |
| 11 | 9 | 4 | 1.5 | 4 | 1.2 | 1.2 |
| 12 | 4 | 2 | 1.1 | 3 | 1.0 | 0.8 |
| 13 | 3 | 1 | 1.1 | 3 | 1.1 | 1.1 |
| 14 | 5 | 5 | 2.0 | 3 | 1.3 | 1.1 |
| 15 | 7 | 4 | 1.4 | 2 | 1.1 | 0.7 |
| 16 | 4 | 1 | 1.3 | 4 | 1.3 | 1.3 |
| 17 | 14 | 4 | 1.0 | 9 | 0.9 | 0.9 |
| 18 | 7 | 2 | 1.1 | 3 | 1.1 | 1.0 |
| 19 | 12 | 5 | 1.4 | 3 | 1.0 | 1.0 |
| 20 | 5 | 2 | 1.0 | 5 | 0.9 | 1.0 |

TABLE 22

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 12. Boy G. Tuberculosis of Cervical Glands

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 5 | 2 | 1.0 | 1 | 1.8 | 1.6 |
| 2 | 8 | 4 | 1.4 | 1 | 1.1 | 1.2 |
| 3 | 5 | 1 | 0.8 | 5 | 0.8 | 0.8 |
| 4 | 7 | 2 | 1.2 | 6 | 1.1 | 1.2 |
| 5 | 5 | 2 | 1.6 | 3 | 1.4 | 1.2 |
| 6 | 6 | 2 | 1.2 | 0 | 1.1 | 1.1 |
| 7 | 5 | 1 | 0.7 | 3 | 0.7 | 0.7 |
| 8 | 7 | 1 | 1.0 | 5 | 1.0 | 1.0 |
| 9 | 3 | 1 | 0.9 | 3 | 0.9 | 0.9 |
| 10 | 26 | 4 | 1.3 | 10 | 1.2 | 1.0 |
| 11 | 12 | 2 | 1.2 | 3 | 1.4 | 1.3 |
| 12 | 8 | 1 | 0.8 | 4 | 0.8 | 0.8 |
| 13 | 7 | 1 | 1.0 | 6 | 1.0 | 1.0 |
| 14 | 6 | 2 | 1.2 | 3 | 1.1 | 1.0 |

TABLE 23

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Girl S.

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 5 | 2 | 1.0 | 3 | 0.9 | 0.9 |
| 2 | 7 | 1 | 1.1 | 7 | 1.1 | 1.1 |
| 3 | 9 | 6 | 1.7 | 7 | 1.3 | 0.7 |
| 4 | 15 | 3 | 1.5 | 9 | 0.9 | 0.9 |
| 5 | 20 | 7 | 1.9 | 5 | 1.4 | 0.7 |
| 6 | 9 | 2 | 1.0 | 3 | 1.0 | 1.0 |

TABLE 24

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 11. Boy W. Tuberculosis of Cervical Glands

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 13 | 6 | 1.1 | 4 | 1.0 | 1.4 |
| 2 | 5 | 3 | 1.5 | 2 | 1.0 | 1.8 |
| 3 | 6 | 1 | 1.0 | 5 | 1.0 | 1.0 |
| 4 | 5 | 1 | 0.8 | 4 | 0.8 | 0.8 |
| 5 | 12 | 2 | 1.2 | 5 | 0.9 | 1.5 |
| 6 | 16 | 3 | 1.1 | 5 | 0.8 | 1.3 |
| 7 | 10 | 2 | 1.1 | 3 | 0.9 | 1.3 |
| 8 | 11 | 3 | 1.3 | 6 | 1.0 | 2.0 |
| 9 | 6 | 1 | 1.0 | 3 | 1.0 | 1.0 |
| 10 | 9 | 1 | 1.0 | 4 | 1.0 | 1.0 |
| 11 | 7 | 1 | 1.0 | 4 | 1.0 | 1.0 |

TABLE 25

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Case 10. Miss S. Tubercular Arthritis

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 7 | 1 | 1.0 | 6 | 1.0 | 1.0 |
| 2 | 7 | 2 | 1.5 | 5 | 1.0 | 1.0 |
| 3 | 6 | 2 | 1.1 | 3 | 1.1 | 1.1 |
| 4 | 8 | 4 | 1.2 | 3 | 1.1 | 1.0 |
| 5 | 7 | 1 | 0.8 | 6 | 0.8 | 0.8 |
| 6 | 20 | 3 | 1.4 | 16 | 0.1 | 0.9 |
| 7 | 7 | 4 | 1.1 | 3 | 1.0 | 1.0 |
| 8 | 8 | 3 | 1.2 | 6 | 0.9 | 0.8 |
| 9 | 6 | 2 | 1.0 | 3 | 1.0 | 1.0 |

TABLE 26

TABLE GIVING DATA COMPILED FROM DAILY RECORD CARDS

Miss T. Dorsal Pott's Disease

| NUMBER OF INJECTION | NUMBER OF DAYS BETWEEN INJECTIONS | NUMBER OF O. I. BETWEEN INJECTIONS | HIGHEST O. I. AFTER EACH INJECTION | DAY OF HIGHEST O. I. | AVERAGE O. I. BETWEEN INJECTIONS | O. I. PREVIOUS TO INJECTION |
|---|---|---|---|---|---|---|
| 1 | 8 | 6 | 1.8 | 5 | 1.3 | 1.0 |
| 2 | 9 | 4 | 1.4 | 7 | 1.1 | 1.0 |
| 3 | 30 | 17 | 1.6 | 3 | 1.3 | 1.1 |
| 4 | 14 | 5 | 1.5 | 6 | 1.2 | 1.1 |
| 5 | 9 | 4 | 1.1 | 8 | 0.9 | 0.7 |

(From tables 1–26, the average of the data was obtained for each patient, as shown in Table 27.)

TABLE 27

TABLE GIVING AVERAGE OF DATA OF TABLES 1 TO 26.

| NAME | NUMBER OF INJECTIONS OF VACCINE | NUMBER OF MONTHS OF TREATMENT | AVERAGE NUMBER OF INJECTIONS PER MONTH | AVERAGE NUMBER OF DAYS BETWEEN INJECTIONS | AVERAGE NUMBER OF OPSONIC INDICES MADE BETWEEN INJECTIONS | AVERAGE OF HIGHEST OP. INDICES BETWEEN INJECTIONS | AVERAGE OF DAYS OF HIGHEST OP. INDEX | AVERAGE OPSONIC INDEX | AVERAGE OF OPSONIC INDICES PREVIOUS TO EACH INJECTION |
|---|---|---|---|---|---|---|---|---|---|
| Mrs. S. | 35 | 8 | 4.4 | 6.8 | 3.8 | 1.4 | 2.8 | 1.2 | 1.0 |
| Mr. B. | 28 | 7 | 4.0 | 7.4 | 3.0 | 1.3 | 2.2 | 1.0 | 1.0 |
| Mrs. E. | 18 | 4 | 4.5 | 7.0 | 2.7 | 1.2 | 2.1 | 1.1 | 0.9 |
| Miss M. | 18 | 4 | 4.5 | 7.0 | 4.4 | 1.7 | 2.5 | 1.2 | 1.0 |
| Mr. L. | 31 | 7.5 | 4.0 | 7.3 | 3.8 | 1.6 | 3.5 | 1.2 | 1.0 |
| Mr. F. | 29 | 7.0 | 4.1 | 7.0 | 2.5 | 1.2 | 3.4 | 1.0 | 1.0 |
| Boy A. | 4 | 1.0 | 4.0 | 6.0 | 5.0 | 1.6 | 1.6 | 1.0 | 0.9 |
| Baby G. | 17 | 3.3 | 5.1 | 3.0 | 2.2 | 1.5 | 2.3 | 1.2 | 1.1 |
| Mr. A. | 20 | 5.0 | 4.0 | 7.0 | 2.0 | 1.5 | 2.6 | 1.4 | 1.3 |
| Mr. B. | 22 | 6.0 | 3.6 | 7.5 | 2.4 | 1.3 | 3.0 | 1.1 | 1.0 |
| Miss H. | 10 | 5.0 | 4.0 | 6.4 | 1.4 | 1.4 | 3.0 | 1.2 | 1.1 |
| Boy P. | 20 | 5.0 | 4.0 | 4.0 | 2.3 | 1.3 | 4.0 | 1.2 | 1.1 |
| Boy B. | 21 | 5.0 | 4.0 | 6.5 | 1.8 | 1.4 | 4.2 | 1.3 | 1.1 |
| Boy O. | 22 | 5.0 | 4.4 | 6.5 | 2.4 | 1.5 | 4.3 | 1.3 | 1.0 |
| Girl K. | 21 | 5.0 | 4.2 | 6.5 | 2.1 | 1.4 | 3.7 | 1.3 | 1.0 |
| Boy S. | 20 | 5.0 | 4.0 | 6.8 | 2.3 | 1.4 | 4.0 | 1.4 | 1.0 |
| Girl R. | 19 | 5.0 | 3.8 | 6.7 | 2.4 | 1.5 | 4.1 | 1.3 | 1.1 |
| Boy B. | 23 | 5.0 | 4.2 | 6.0 | 2.2 | 1.4 | 4.0 | 1.3 | 1.1 |
| Mr. F. | 21 | 5.0 | 4.2 | 7.3 | 2.7 | 1.2 | 4.0 | 1.1 | 1.0 |
| Girl L. | 21 | 5.0 | 4.2 | 6.7 | 2.2 | 1.3 | 4.0 | 1.2 | 1.1 |
| Girl G. | 20 | 5.0 | 4.0 | 6.4 | 2.4 | 1.2 | 3.6 | 1.1 | 1.0 |
| Boy G. | 14 | 4.0 | 3.5 | 7.9 | 2.0 | 1.2 | 3.7 | 1.1 | 1.0 |
| Girl S. | 7 | 3.0 | 2.3 | 1.0 | 3.5 | 1.4 | 5.6 | 1.1 | 0.9 |
| Boy W. | 11 | 3.5 | 3.1 | 9.1 | 2.2 | 1.3 | 4.2 | 1.1 | 0.9 |
| Miss S. | 9 | 2.5 | 3.6 | 8.4 | 2.4 | 1.1 | 5.6 | 0.9 | 0.9 |
| Miss F. | 5 | 2.3 | 2.2 | 16.0 | 7.0 | 1.5 | 6.0 | 1.2 | 1.0 |

TABLE 28

TABLE SHOWING THE SHORTEST AND LONGEST INTERVAL BETWEEN INJECTIONS OF VACCINE

| NAME | NUMBER OF MONTHS TREATED | SMALLEST NUMBER OF DAYS BETWEEN INJECTIONS | LARGEST NUMBER OF DAYS BETWEEN INJECTIONS |
|---|---|---|---|
| Mrs. S | 8 | 4 | 17 |
| Mr. B | 7 | 4 | 20 |
| Mrs. E | 4 | 3 | 10 |
| Miss M | 4 | 3 | 21 |
| Miss B | 4 | 3 | 10 |
| Mr. L | 7.5 | 4 | 26 |
| Mr. F | 7 | 4 | 18 |
| Boy A | 5 | 5 | 8 |
| Mrs. P | 2 | 4 | 10 |
| Mrs. W | 1 | 4 | 7 |
| Baby G | 3 | 4 | 10 |
| Mr. A | 5 | 3 | 22 |
| Mr. B | 6 | 4 | 16 |
| Miss H | 5 | 3 | 13 |
| Boy P | 5 | 4 | 16 |
| Boy B | 5 | 4 | 23 |
| Boy O | 5 | 4 | 14 |
| Girl R | 5 | 4 | 17 |
| Boy S | 5 | 4 | 21 |
| Girl R | 5 | 3 | 23 |
| Boy B | 5 | 4 | 14 |
| Mr. F | 5 | 4 | 13 |
| Girl L | 5 | 4 | 20 |
| Girl G | 5 | 3 | 14 |
| Boy G | 4 | 3 | 26 |
| Girl S | 3 | 5 | 20 |
| Boy W | 3.5 | 5 | 16 |
| Miss S | 2.5 | 6 | 20 |
| Miss F | 2.3 | 8 | 30 |

sisted of physicians and nurses. The range of their tuberculo-opsonic index was found, with six exceptions, to be as in the case of the five normals, 0.8 to 1.2. The remarkably low index of 0.3 was found in the case of 2 physicians. The index persisted in being low in one of these cases on further examinations; it was also found low, *e. g.* 0.5, on a second examination in the second physician, but there was a history of tuberculosis in the family in this latter case. A second examination of the blood, showing the high indices in the first examination, brought the indices within the average range.

We may, then, say that the normal tuberculo-opsonic index ranges from 0.8 to 1.2, and that the average of any group of three or five of these indices is never below 0.9 or over 1.2.

Compare this with the tuberculo-opsonic index of the patients. The average (Table 29 (b) ) of the opsonic indices before treatment in 40 patients was found to be 0.68 and the range from 0.35 to 0.9.

2. *Is the clinical diagnosis consistent with that of the tuberculo-opsonic index?*

Of the 75 cases examined, 40 being cases treated and 35 for diagnosis, there were four cases whose clinical and opsonic index diagnosis did not agree.

Case 47. Mrs. J. Clinical diagnosis: Tubercular peritonitis. Examination of specimen removed from the peritoneum showed typical tubercles. Eleven examinations of the tuberculo-opsonic index, eight of these being to the human tubercle bacillus and three to the bovine, gave a persistent normal index, with the exception of one index of 0.7 to the bovine tubercle bacillus.

Case 48. Mrs. D. Clinical diagnosis: Tubercular adenitis. The tuberculo-opsonic index was normal in 3 examinations.

Case 5. Miss B. Osteitis of tarsal and metatarsal bones of right foot. This patient, as shown in Tables 5,28, 29(b) and Chart 5, had a persistently low tuberculo-opsonic index before inoculation, although there has been found after very careful and complete examination no definite evidence of tubercular infection. Sections of bone fragments removed showed simply a rarefying osteitis, with no conclusive evidence of tuberculosis.

Case 34. Girl W. Age 11. Physical examination: Small ulcer on foot. Mass of broken down inguinal glands with 2 or 3 discharging fistulæ. Swollen tender glands above Poupart's ligament and in pelvis. Eruption over whole body, face, and extremities. Clinical diagnosis doubtful, syphilis or tuberculosis. Tuberculo-opsonic index was normal in 3 examinations. Pathological report of curetted tissues was tuberculosis.

TABLE 29 (a)

NORMAL TUBERCULO-OPSONIC INDEX

| Normal H | | Normal L. | | Normal V. | | Normal G. | | Normal J. | | Single Estimation 100 Normals | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Opsonic Index | Average of each 3 | Opsonic Index | Average of each 3 | Opsonic Index | Average of each 3 | Opsonic Index | Average of each 3 | Opsonic Index | Average of each 3 | Opsonic Index | Average of each 3 |
| 1.0 | | 1.0 | | 0.8 | | 0.8 | | 1.0 | | 0.8 | |
| 1.0 | | 1.0 | | 1.0 | | 0.9 | | 1.2 | | 1.0 | |
| 1.0 | 1.0 | 0.9 | 1.0 | 1.0 | 0.9 | 1.0 | 0.9 | 1.1 | 1.1 | 1.0 | 0.9 |
| 1.0 | | 1.0 | | 1.1 | | 1.0 | | 0.8 | | 0.8 | |
| 0.9 | | 1.0 | | 1.0 | | 1.2 | | 0.9 | | 1.2 | |
| 0.9 | 0.9 | 1.2 | 1.1 | 1.1 | 1.1 | 1.0 | 1.1 | 0.9 | 0.9 | 1.0 | 1.0 |
| 0.0 | | 1.0 | | 1.2 | | 1.0 | | 1.0 | | 1.0 | |
| 1.0 | | 0.9 | | 1.2 | | 1.0 | | 0.9 | | 1.4 | |
| 1.0 | 1.0 | 1.1 | 1.0 | 0.8 | 1.1 | 0.8 | 0.9 | 1.0 | 1.0 | 0.3 | 0.9 |
| 1.1 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 0.9 | |
| 1.0 | | 1.0 | | 1.1 | | 1.0 | | 0.9 | | 0.3 | |
| 1.0 | 1.0 | 0.9 | 1.0 | 0.9 | 1.0 | 0.8 | 0.9 | 1.0 | 1.0 | 1.5 | 0.9 |
| 1.0 | | 1.0 | | 1.0 | | 1.1 | | 1.2 | | 0.8 | |
| 1.8 | | 1.0 | | 0.9 | | 0.9 | | 1.1 | | 0.9 | |
| 1.0 | 0.9 | 1.2 | 1.1 | 0.7 | 0.9 | 1.0 | 1.0 | 1.1 | 1 | 0.5 | 0.9 |
| 1.1 | | 1.0 | | 0.8 | | 1.0 | | 0.8 | | 0.6 | |
| 1.0 | | 1.0 | | 1.1 | | 1.1 | | 1.1 | | 1.0 | |
| 0.9 | 1.0 | 1.0 | 1.0 | 0.8 | 0.9 | 1.4 | 1.2 | 1.1 | 1.0 | 1.0 | 0.9 |
| 1.0 | | 1.0 | | 1.2 | | 1.0 | | 0.9 | | 1.0 | |
| 0.8 | | 1.0 | | 1.0 | | 0.9 | | 0.9 | | 1.1 | |
| 0.9 | 0.9 | 0.9 | 1.0 | 1.0 | 1.1 | 1.1 | 1.0 | 1.0 | 0.9 | 1.0 | 1.0 |
| 1.1 | | 1.0 | | 1.1 | | 1.0 | | 1.2 | | 1.1 | |
| 1.0 | | 1.2 | | 1.1 | | 1.1 | | 1.0 | | 1.0 | |
| 1.0 | 1.0 | 1.0 | 1.1 | 1.0 | 1.1 | 1.2 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 |
| 1.0 | | 1.0 | | 0.8 | | 1.0 | | 0.9 | | 1.0 | |
| 1.2 | | 0.8 | | 1.0 | | 1.3 | | 0.9 | | 1.0 | |
| 0.8 | 1.1 | 1.0 | 0.9 | 1.0 | 0.9 | 1.0 | 1.1 | 0.9 | 0.9 | 1.0 | 1.0 |
| 1.0 | | 1.0 | | 1.2 | | 0.8 | | 1.2 | | 1.1 | |
| 1.0 | | 1.2 | | 1.0 | | 0.8 | | 1.0 | | 1.2 | |
| 1.0 | 0.9 | 1.0 | 1.1 | 0.9 | 1.0 | 1.1 | 0.9 | 0.9 | 1.0 | 1.0 | 1.1 |
| 1.2 | | 1.0 | | 1.0 | | 0.9 | | 1.2 | | 0.9 | |
| 1.0 | | 0.9 | | 1.3 | | 1.0 | | 0.9 | | 1.1 | |
| 1.0 | 1.1 | 1.3 | 1.1 | 0.9 | 1.1 | 1.1 | 1.0 | 1.0 | 1.0 | 0.9 | 1.0 |
| 0.9 | | 1.0 | | 0.7 | | 1.1 | | 0.9 | | 1.1 | |
| 1.2 | | 1.0 | | 1.2 | . | 0.9 | | 0.8 | | 0.9 | |
| 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 0.9 | 0.9 | 1.0 | 0.8 | 0.8 | 1.1 | 1.0 |
| 1.0 | | 1.2 | | 1.0 | | 0.9 | | 1.0 | | 1.0 | |
| 0.8 | | 1.2 | | 0.9 | | 1.1 | | 0.9 | | 1.1 | |
| 0.8 | 0.9 | 1.0 | 1.1 | 1.1 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 |
| 1.0 | | 1.0 | . | 1.0 | | 0.9 | | 1.0 | | 0.9 | |
| 0.9 | | 0.9 | | 1.0 | | 1.1 | | 1.0 | | 1.1 | |
| 1.2 | 0.9 | 1.0 | 1.0 | 0.7 | 0.9 | 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 1.0 |
| 0.8 | | 0.8 | | 1.2 | | 1.0 | | 1.0 | | 0.9 | |
| 1.0 | | 1.2 | | 1.1 | | 1.0 | | 0.8 | | 1.1 | |
| 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 1.1 | 0.9 | 1.0 | 1.1 | 1.0 | 1.1 | 1.0 |
| 0.8 | | 0.9 | | 0.9 | | 1.1 | | 1.1 | | 1.0 | |
| 1.1 | | 1.2 | | 0.9 | | 0.9 | | 1.2 | | 1.1 | |
| 0.9 | 1.0 | 1.0 | 0.9 | 1.1 | 1.0 | 0.9 | 1.0 | 1.0 | 1.1 | 1.1 | 1.1 |
| 1.0 | | 0.8 | | 0.9 | | 0.8 | | 1.0 | | 0.9 | |
| 1.1 | | 1.0 | | 1.3 | | 1.0 | | 1.0 | | 1.1 | |
| 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 1.0 | 0.9 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 |
| 1.0 | | 1.0 | | 0.8 | | 1.0 | | 1.0 | | 0.9 | |
| 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.1 | |
| 1.0 | 1.0 | 1.0 | 1.0 | 1.2 | 1.0 | 1.0 | 1.0 | 1.1 | 1.0 | 1.1 | 1.0 |
| 1.3 | | 1.1 | | 0.9 | | 1.0 | | 1.0 | | 0.8 | |
| 1.0 | | 1.0 | | 0.9 | | 0.9 | | | | 1.0 | |
| 1.0 | 1.1 | 1.0 | 1.0 | 0.9 | 0.9 | 1.0 | 1.0 | | | 0.9 | 0.9 |
| 1.0 | | 1.1 | | 0.8 | | 0.9 | | | | 0.8 | |
| 0.9 | | 1.0 | | 1.1 | | 0.9 | | | | 1.1 | |
| 1.0 | 1.0 | 1.1 | 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | | | 1.1 | 1.0 |
| 1.0 | | 0.9 | | 1.1 | | 0.9 | | | | 1.0 | |
| 0.9 | | 1.2 | | 1.0 | | 1.0 | | | | 1.0 | |
| 1.0 | 1.0 | 1.2 | 1.1 | 1.3 | 1.1 | 1.0 | 1.0 | | | 0.9 | 1.0 |
| 1.0 | | 0.8 | | 1.0 | | 1.1 | | | | 0.8 | |
| 0.9 | | 0.9 | | 0.8 | | 0.9 | | | | 0.8 | |
| 0.9 | 1.0 | 1.2 | 1.0 | 1.1 | 1.0 | 1.0 | 1.0 | | | 0.8 | 0.8 |
| 1.1 | | 1.1 | | 1.0 | | 0.9 | | | | 0.8 | |
| 0.8 | | 1.0 | | 1.0 | | 0.8 | | | | 1.2 | |
| 1.0 | 1.0 | 1.0 | 1.1 | 0.9 | 1.0 | 0.8 | 0.8 | | | 0.8 | 0.9 |
| 0.9 | | 1.0 | | 0.9 | | 1.1 | | | | 1.2 | |
| 0.9 | | 1.1 | | 1.1 | | 1.0 | . | | | 1.0 | |
| 0.9 | 0.9 | 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 1.0 | | | 0.8 | 1.0 |

Three months later, after curetment of ulcer and broken down glands and thorough anti-syphilitic treatment, the patient, although much improved, still had a large gland above Poupart's ligament. A series of examinations of the tuberculo-opsonic index made at this time gave a low average. It is possible that a larger number of estimations of the opsonic index would have given a low average opsonic index at the first examination.

## THE TUBERCULO-OPSONIC INDEX TO THE HUMAN *vs.* THE BOVINE TUBERCLE BACILLUS

The question of the infection of the human by the bovine tubercle bacillus came up in one of our cases of tubercular peritonitis.

TABLE 29 (a) — continued.

| Normal H. | | Normal L. | | Normal V. | | Normal G | | Normal J | | Single Estimation 100 Normals | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Opsonic Index | Average of each 3 | Opsonic Index | Average of each 3 | Opsonic Index | Average of each 3 | Opsonic Index | Aherage of each 3 | Opsonic Index | Average of each 3 | Opsonic Index | Average of each 3 |
| | | 1.0 | | 0.9 | | | | | | 0.8 | |
| | | 1.2 | 1.1 | 1.0 | | | | | | 1.0 | |
| | | 1.0 | | 1.0 | 1.0 | | | | | 0.9 | 0.9 |
| | | 0.8 | | 1.0 | | | | | | 1.0 | |
| | | 0.8 | 0.9 | 0.9 | | | | | | 1.0 | |
| | | 1.0 | | 1.1 | 1.0 | | | | | 1.2 | 1.1 |
| | | 0.7 | | 0.9 | | | | | | 1.1 | |
| | | 1.2 | 1.0 | 1.1 | | | | | | 1.0 | |
| | | 0.8 | | 1.0 | 1.0 | | | | | 0.8 | |
| | | 0.9 | | 1.0 | | | | | | 1.0 | |
| | | 1.0 | | 1.1 | 1.1 | | | | | 1.1 | |
| | | 0.9 | | 1.0 | | | | | | 1.0 | |
| | | 1.1 | | 1.0 | 1.0 | | | | | 0.9 | 0.9 |
| | | 0.8 | | 1.0 | | | | | | 1.0 | |
| | | 0.8 | | 1.0 | | | | | | 1.0 | |
| | | 0.9 | | 1.0 | 1.0 | | | | | 0.8 | 0.9 |
| | | 1.0 | | 1.0 | | | | | | 1.0 | |
| | | 1.0 | | 1.0 | | | | | | 0.9 | |
| | | 1.0 | | 1.0 | 1.0 | | | | | 1.0 | |
| | | 1.0 | | 1.0 | | | | | | 0.9 | |
| | | 1.0 | | 1.0 | | | | | | 0.8 | |
| | | 1.0 | | 1.0 | 1.0 | | | | | 1.0 | 0.9 |
| | | 1.0 | | 1.0 | | | | | | 0.9 | |
| | | 1.0 | | 1.0 | | | | | | 0.8 | |
| | | 1.0 | | 1.0 | 1.0 | | | | | 1.0 | |
| | | 1.0 | | 1.0 | | | | | | 0.9 | |
| | | 1.0 | | 1.0 | | | | | | 0.9

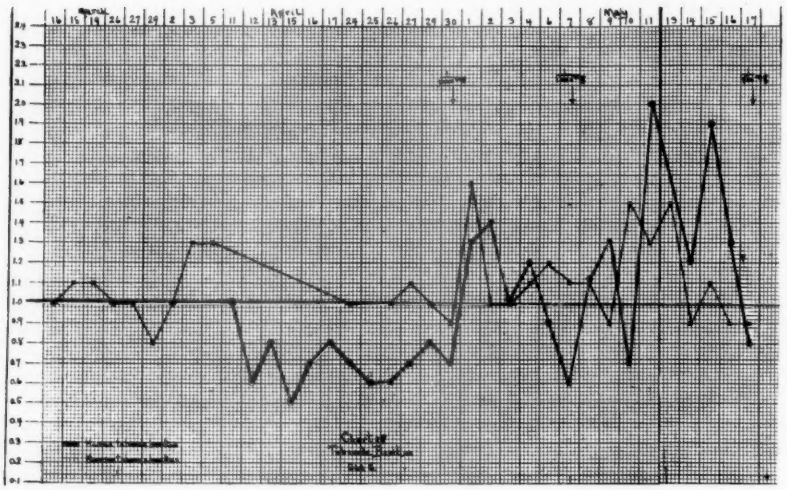


Fig. 51. The black line represents the opsonic index for human tubercle bacillus and the red bovine tubercle bacillus. Taken from girl G. See page 425 and Table 30.

The history of the case is as follows:

Case No. 27. Girl G. Age 13 years. Colored. Clinical history: Sick for last 4 months. Pain and swelling in abdomen for a month only before coming to hospital. Operation 2 weeks later. Diagnosis: General peritoneal tuberculosis. Probable origin: Appendix, as shown by pathological specimen, removed at operation. Fistula from wound now discharging pus. Fecal fistula. Leucocytic count high for tuberculosis, 12, to 15,000.

The tuberculo-opsonic index to the human tubercle bacillus was persistently normal in this case, but to the bovine was below normal, as shown in Table 30.

To learn whether the tuberculo-opsonic index to the human and bovine tubercle-bacilli did or did not correspond in other patients, examinations were made comparing at the same time the index to the human and the bovine. The following table shows that they do not always correspond. In the cases where the tuberculo-opsonic index to the human tubercle bacillus was below or above normal, the tuberculo-opsonic index to the bovine tubercle bacillus was normal. See Table 31.

In the treatment of this case a vaccine of the bovine tubercle bacillus should theoretically be used, but for immediate treatment the vaccine of the human tubercle bacillus was used in the hope of raising the index.

From a study of the curve of the opsonic reaction chart (Fig. 51) it will be seen that the index to both the human and bovine tubercle bacillus rose after each injection, but that the curve of the human does not correspond exactly with the curve of the bovine. In other words, the index to the human tubercle bacillus is not always high on the same day as that of the bovine tubercle bacillus.

It would appear, then, that the vaccine of closely related micro-organisms can stimulate the formation of opsonins to these different micro-organisms.

The treatment has not been used long enough to draw any conclusions as to clinical results. A vaccine prepared from the bovine tubercle bacillus will be injected as soon as it can be prepared.

### LABORATORY TECHNIC AND ITS RELIABILITY IN OPSONIC INDEX DETERMINATIONS.

The question of accurate technic is of fundamental importance when one considers how much the value of the vaccine therapy depends on the laboratory work. Some of the discrepancies in results from the various laboratories I believe were due to differences in points of technic, especially with reference to the emulsion, the number and distribution

TABLE 29 (b)

TABLE SHOWING AVERAGE AND RANGE OF OPSONIC INDICES BEFORE TREATMENT OF 40 PATIENTS

| NAME | AVERAGE OF OP. INDICES BEFORE TREATMENT | RANGE OF OP. INDICES BEFORE TREATMENT | NAME | AVERAGE OF OP. INDICES BEFORE TREATMENT | RANGE OF OP. INDICES BEFORE TREATMENT |
|---|---|---|---|---|---|
| Mrs. S..... | 0.5 | 0.5–0.5 | 17 Girl R.... | 0.6 | 0.5–0.8 |
| Mr. B..... | 0.5 | 0.5–0.5 | 18 Boy B.... | 0.6 | 0.6–0.7 |
| Mrs. E..... | 0.6 | 0.6–0.7 | 19 Mr. F.... | 0.7 | 0.6–0.8 |
| Miss M..... | 0.6 | 0.3–0.8 | 20 Girl L.... | 0.7 | 0.6–0.8 |
| Miss B..... | 0.6 | 0.6–0.7 | 33 Mrs. P... | 0.6 | 0.6–0.7 |
| Mr. L..... | 0.4 | 0.2–0.6 | 21 Girl G.... | 0.9 | 0.8–1.0 |
| Mr. F..... | 0.7 | 0.6–0.7 | 34 Girl 2.... | 0.8 | 0.7–1.0 |
| Boy A..... | 0.7 | 0.7–0.8 | 35 Mrs. S... | 0.6 | 0.6–0.7 |
| Baby G..... | 0.7 | 0.7 | 22 Boy G.... | 0.7 | 0.6–0.8 |
| Mrs. P..... | 0.8 | 0.8–0.8 | 23 Girl S.... | 0.7 | 0.7–0.8 |
| Mrs. W..... | 0.9 | 0.7–1.3 | 24 Boy W.... | 0.7 | 0.7–0.8 |
| Mr. A..... | 0.9 | 0.9–1.1 | 25 Miss S.... | 0.8 | 0.7–1.0 |
| Mr. B..... | 0.9 | 0.9–1.2 | 36 Boy F.... | 0.7 | |
| Mrs. H..... | 0.3 | 0.3–0.4 | 26 Miss F... | 0.7 | 0.6–0.8 |
| Miss H..... | 0.7 | 0.6–0.8 | 27 Girl G.... | 0.7 | |
| Boy P..... | 0.6 | 0.6–0.7 | 37 Mr. J.... | 0.9 | 0.7–1.0 |
| Boy B..... | 0.7 | 0.6–0.7 | 38 Mr. M.... | 0.7 | 0.3–1.2 |
| Boy O..... | 0.6 | 0.6–0.7 | 39 Mr. G.... | 0.8 | 0.7–1.0 |
| Girl K..... | 0.6 | 0.5–0.6 | 40 Mrs. G.... | 0.7 | 0.7–0.8 |
| Boy S..... | 0.5 | 0.4–0.6 | 41 Mr. F.... | 0.8 | |
| [illegible] | | | 32 Boy B.... | 0.8 | 0.7–1.0 |

TABLE 30

TABLE GIVING OPSONIC INDICES OF GIRL G. NO. 27 TO THE HUMAN AND BOVINE TUBERCLE BACILLUS

| DATE | INOCULATED | O. I. TO HUMAN TUBERCLE BACILLUS | O. I. TO BOVINE TUBERCLE BACILLUS | DATE | INOCULATED | O. I. TO HUMAN TUBERCLE BACILLUS | O. I. TO BOVINE TUBERCLE BACILLUS |
|---|---|---|---|---|---|---|---|
| Mar. 16 | | 1.0 | | May 8 | | 1.1 | 1.1 |
| 18 | | 1.1 | | 9 | | 1.1 | 1.3 |
| 19 | | 1.1 | | 10 | | 1.5 | 0.7 |
| 26 | | 1.0 | | 11 | | 1.3 | |
| 27 | | 1.0 | | 13 | | 1.5 | 2.0 |
| 29 | | 0.9 | | 14 | | 0.9 | 1.2 |
| Apr. 2 | | 1.0 | | 15 | | 1.1 | 0.9 |
| 3 | | 1.3 | | 16 | | 0.9 | 1.3 |
| 5 | | 1.3 | | | | | |
| 11 | | | 1.0 | 17 | 1 mg / 1000 human tubercle bacilli | 0.9 | 0.8 |
| 12 | | | 0.6 | | | | |
| 13 | | | 0.8 | 18 | | 0.9 | 1.2 |
| 15 | | | 0.5 | 20 | | 1.2 | 1.6 |
| 16 | | | 0.7 | 21 | | 0.9 | 1.5 |
| 17 | | | 0.8 | 23 | | 0.9 | |
| 24 | | 1.0 | 0.7 | 24 | | 0.8 | 1.0 |
| 26 | | 1.0 | 0.6 | 27 | | | 1.2 |
| 27 | | 1.1 | 0.7 | 28 | | 1.3 | 1.0 |
| 29 | | 1.0 | 0.8 | | | | |
| 30 | 1 mg / 1000 human tubercle bacilli | 0.9 | 0.7 | 29 | 1 / 800mg human tubercle bacilli | | |
| | | | | 31 | | 1.4 | 1.5 |
| May 1 | | 1.6 | 1.3 | June 1 | | 1.4 | 0.7 |
| 2 | | 1.0 | 1.4 | 4 | | 1.5 | |
| 3 | | 1.0 | 1.4 | 6 | | 1.1 | 1.2 |
| 4 | | 1.1 | 1.2 | | | | |
| 6 | | 1.2 | 0.9 | | | | |
| 7 | 1 mg / 1000 human–tubercle bacilli | | | | | | |

of the leucocytes, and the standard of counting.

The following are some suggestions as to technic, which our experience has shown are of value in obtaining reliable results.

1. *Preparation of the Emulsion of Tubercle Bacilli.*

The tubercle bacilli are obtained from the

TABLE 31

TABLE SHOWING COMPARISON BETWEEN TUBERCULO-OPSONIC INDEX TO THE HUMAN AND THE BOVINE TUBERCLE BACILLUS

| NAME | AVERAGE OPSONIC INDEX TO HUMAN TUBERCLE BACILLUS PREVIOUS TO TREATMENT | DATE | OPSONIC INDEX TO HUMAN TUBERCLE BACILLUS | OPSONIC INDEX TO BOVINE TUBERCLE BACILLUS |
|---|---|---|---|---|
| Girl G..... | 1.0 | 3/27 | 1.0 | 0.6 |
| Mr. M..... | 0.7 | 4/25 | 0.6 | 1.0 |
| Girl P..... | 1.0 | 4/25 | 0.9 | 0.6 |
| Girl P..... | 1.0 | 4/27 | 1.0 | 0.7 |
| Mr. C..... | 1.0 | 5/3 | 1.0 | 1.0 |
| Mr. C..... | 1.0 | 5/4 | 1.0 | 1.2 |
| Mr. P..... | 1.0 | 5/3 | 1.0 | 1.2 |
| Boy W..... | 0.7 | 5/3 | 0.8 | 1.2 |
| Boy P..... | 0.6 | 5/6 | 1.1 | 0.9 |
| Boy B..... | 0.7 | 5/6 | 1.1 | 1.2 |
| Boy O..... | 0.6 | 6/6 | 1.0 | 1.0 |
| Boy B..... | 0.9 | 5/6 | 1.1 | 1.0 |
| Girl L..... | 0.7 | 5/6 | 1.4 | 0.9 |
| Boy L..... | 0.9 | 5/6 | 0.7 | 1.0 |
| Girl G..... | 0.9 | 5/6 | 1.3 | 0.8 |
| Mr. I..... | 0.5 | 5/6 | 0.7 | 1.0 |
| Mr. F..... | 0.8 | 5/3 | 1.0 | 0.8 |

TABLE 32

COMPARISON OF COUNTS OF THE SAME SLIDE MADE BY DIFFERENT PERSONS

| | OPSONIC INDEX | | | | OPSONIC INDEX | | | |
|---|---|---|---|---|---|---|---|---|
| SLIDE | COUNTED BY LINCOLN | COUNTED BY LINE | COUNTED BY MALONEY | SLIDE | COUNTED BY LINCOLN | COUNTED BY LINE | COUNTED BY MALONEY |
| No. 1 | 0.8 | 1.4 | 0.9 | No. 27 | 0.9 | 0.6 | 0.9 |
| 2 | 1.0 | 1.1 | | 28 | 1.1 | 1.0 | 1.0 |
| 3 | | 1.1 | 1.0 | 29 | 1.0 | 1.0 | 1.0 |
| 4 | | 1.0 | 1.1 | 30 | 1.1 | 1.0 | 0.9 |
| 5 | | 1.0 | 0.9 | 31 | 1.0 | 1.1 | 1.1 |
| 6 | 1.0 | 1.1 | 1.0 | 32 | 0.9 | 1.0 | 1.0 |
| 7 | 0.8 | | 0.8 | 33 | 1.2 | 1.3 | 0.9 |
| 8 | 0.8 | 1.0 | 1.1 | 34 | 1.1 | 1.2 | 1.0 |
| 9 | 1.2 | 1.2 | | 35 | 1.3 | 1.1 | 1.0 |
| 10 | 0.9 | 0.8 | | 36 | 0.8 | 1.1 | 0.9 |
| 11 | 1.1 | 0.9 | 0.9 | 37 | 1.4 | 1.2 | 1.0 |
| 12 | 0.9 | 1.1 | | 38 | 0.9 | 0.9 | 0.7 |
| 13 | 1.0 | | 1.1 | 39 | 0.9 | 0.9 | |
| 14 | 1.0 | 1.1 | | 40 | 1.1 | 1.1 | 1.3 |
| 15 | 0.9 | 1.2 | | | | | |
| 16 | 0.9 | 0.9 | | | | | |
| 17 | 1.0 | 0.9 | | | | | |
| 18 | 1.0 | 1.1 | | | | | |
| 19 | 0.8 | 1.0 | | | | | |
| 20 | 1.1 | 0.9 | | | | | |
| 21 | 1.2 | 1.0 | | | | | |
| 22 | 0.9 | 0.9 | | | | | |
| 23 | 1.1 | 1.1 | | | | | |
| 24 | 1.0 | 1.0 | | | | | |
| 25 | 0.9 | 0.8 | | | | | |
| 26 | 0.9 | 0.7 | 0.9 | | | | |

residue from the manufacture of Koch's Old Tuberculin. The residue is washed thoroughly by shaking with 1.5 per cent salt solution, using 200 c. c. of the solution to each g. of the residue. The washed residue is then filtered through a small filter paper, scraped off the paper, dried thoroughly in the incubator and ground to a powder in an agate mortar. A small amount of the powder, about 200 mg., is ground vigorously for an hour with a very small amount of 1.5 per cent of salt solution, adding a few drops from time to time. During the last fifteen minutes of the grinding enough of the salt solution may be added to make about 2 c. c. of a very cloudy emulsion. This is centrifuged 5 minutes, or long enough to throw down the clumps, leaving a cloudy liquid above. The supernatant liquid is pipetted off and examined with normal serum to learn its strength, as in testing the opsonic index. If there is a greater bacterial average than one bacillus per leucocyte, dilute the necessary amount and examine a second time. When the emulsion is of the proper strength, aspirate into capsules (see Plate 1), seal both

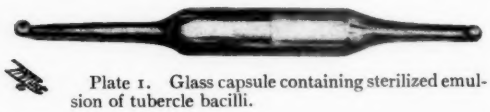


Plate 1. Glass capsule containing sterilized emulsion of tubercle bacilli.

ends and immerse in boiling water for one hour to sterilize. The emulsion prepared in this way keeps indefinitely and remains of standard strength, so that when ready to use it is only necessary to shake the capsule thoroughly, break off one end and mix contents with capillary pipette. Sufficient emulsion can be made up with one grinding to last at least a month.

### 3. *Uniformity of Smears.*

One of the most important points in technic is the obtaining of uniformity in the number of bacteria, the number of leucocytes and a similarity in the distribution of the leucocytes on the slides. The above considerations must be fulfilled as far as possible, in order to obtain a true idea of phagocytosis and hence of the opsonic content of the blood. Just here is where differences in count can easily be made, and hence wide variations in opsonic index determinations by different workers.

The bacterial emulsion should be as near the same strength as possible from day to day; it should be as free from clumps as possible; it should have a bacterial average, with normal serum, of 0.8 to 1.0. If clumps are present in the leucocytes, such leucocytes must be passed by uncounted, and hence a large source of error may creep in here. For we must assume that more leucocytes will have bacterial clumps in the case of the serum with the high opsonin content than in the case of the serum with the low opsonin content, and since the count must be made of the leucocytes containing a countable number of bacteria, the opsonic index of the former serum will appear lower than is actually the case. On the other hand, a very weak emulsion gives rise to even more serious errors, for the missing of the few leucocytes containing bacteria may nearly double the opsonic index.

It is possible to obtain an emulsion comparatively free from clumps and having a bacterial average with normal serum of 0.7 to 1.0, and hence to have the same strength of emulsion from day to day, if one follows the directions given under the head of emulsion.

Of equal importance is the uniformity in the number of leucocytes and the similarity of their distribution in the smear. It is evident that any comparison between two smears, one having twice as many leucocytes as the other, is unfair, because the same number of bacteria will be distributed among half as many leucocytes in one case as in the other. A more equal number of leucocytes may be obtained on each smear if care is taken in fishing the leucocytes from the surface of the cream, dipping to the same depth each time. The leucocytes are to be found along the edge of the tongue of the smear.

### 4. *Counting of the Bacteria.*

A consistent standard of counting is essential to obtain accurate results. With a low power lens a proper field is selected, that is, one on which the leucocytes are not clumped, or very numerous, but where they are fairly uniformly distributed. In such fields under the oil immersion the bacteria in 50 leucocytes are counted,

the counter fixing for himself his standard as to whether the bacteria are within or without the leucocyte, are one or more bacilli, etc. But it must be emphasized that having established such a standard for himself and having selected certain types of fields, he must follow the same procedure with all the slides. Every experienced counter has discovered that on one and the same slide he can make widely different counts by selecting different parts of the slide, hence if he varies in his standard of selecting fields among the slides, he will obtain erroneous opsonic indices. Table 32 shows a comparison of the counts of the same slides made by three different individuals, when each held consistently to her own standard of counting throughout.

CONCLUSIONS

1. In 350 examinations the normal tuberculo-opsonic index, with 20 exceptions, was found to range from 0.8 to 1.2, and in groups of 3 or 5 to average 1.0.

2. Of the 75 cases examined for diagnosis, the clinical and the tuberculo-opsonic index diagnosis agreed in 95 per cent.

3. The opsonic index is a valuable guide in the administration of the tubercle vaccine.

At least two opsonic index examinations should be made between injections.

4. In summing up the data obtained by us as to the reliability of the opsonic index determinations, there are three striking results that present themselves:

(*a*) The comparatively small difference in the counts made by three different individuals of the same 40 slides (Table 32).

(*b*) The small range, *e. g.* 0.8 to 1.2., of the opsonic index of normals in over 350 examinations. It would seem impossible to obtain such comparatively uniform indices with an unreliable technique (Table 29 (a) ).

(*c*) The generally consistent opsonic indices, *e. g.* such as one would expect to follow vaccine injections, in over 2000 estimations.

## OBSERVATIONS ON THE OPSONIC INDEX AND VACCINE THERAPY AS APPLIED TO STAPHYLOCOCCUS INFECTIONS

By Grace Frith-Hagans, M. D.

### VACCINE EXPERIMENTS

By reason of the rather tedious formula for making vaccine and the many chances of contamination that arise in its several transfers to the final bottle for use, the question arises, Is there no easier method of procedure, and is it necessary to count the bacteria?

A number of cases have been reported where the vaccine, consisting of a two weeks' bouillon culture of staphylococci inoculated from the patient's lesion, was given by bulk and not by the number of organisms, the initial dose being one to two c. c. and increased according to the judgment of the giver. These reports present these problems: Do all strains grow with equal rapidity, and multiply in the same proportion under the same conditions, *i. e.*, heat, media, time of incubation? Do the same strains grow and multiply twice alike under the above conditions? Will an increase in bulk of vaccine made this way also mean an increase in the number of organisms? To answer these questions four tubes, each containing eight c. c. of bouillon, were inoculated on the same day with equal amounts of different strains of staphylococcus, from cases *a*, *b*, *c* and *d*, and two more tubes were inoculated from *c* and *d*, making in all one culture from *a* and *b*, and two cultures from *c* and *d*. At the end of fourteen days these tubes were sealed and shaken vigorously for forty minutes to break the clumps, and counted by comparing with the red blood corpuscles in the manner used for counting vaccines (see plate), with the following results:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *a* | (case of | furunculosis), | 4,000 | million | per | c.c. |
| *b* | ( " | " | acne) | - - | 3,330 | " | " | " |
| $c^1$ | ( " | " | " ) | - - | 1,250 | " | " | " |
| $c^2$ | ( " | " | " ) | - - | 1,190 | " | " | " |
| $d^1$ | ( " | " | furunculosis), | 3,000 | " | " | " |
| $d^2$ | ( " | " | " ), | 4,125 | " | " | |

This gives a difference of 2935 million, or practically 3000 million organisms per c. c. between the thickest and the thinnest of this series of cultures, two of which were from acne pustules and two from furuncles. Hence in a dose of 2 c. c. there would be a variation of 6000 million. In the instance of case *c* the

variation of a similar dose from the two cultures would be 120 million, which is not a grave matter, but in case *d*, the difference would be 2250 million, which is twice the average dose. From these variations, in order to avoid an overdose with general malaise following, and to be able to increase the dose in a known accurate way, there is but one method of preparing the vaccines, and that is to count the bacteria.

### THE PREPARATION OF VACCINE

A culture from the pus of the patient's lesion is obtained and the staphylococcus isolated. In the majority of skin lesions the staphylococcus is the only organism found. Two c. c. of bouillon are inoculated and incubated for forty-eight hours. Part of this growth is poured upon slant agar which has been prepared in broadsided flasks, to give an abundant surface. The flasks are incubated two days. About 5 c. c. of normal salt solution are now poured into the flask to wash off the growth. This is done by tipping the flask from side to side several times gently in order not to break the agar, and is preferable to scraping off with a platinum wire. The contents of the flask are poured into a large tube, the end of which is subsequently sealed with the blowpipe. To break the clumps sufficiently for counting, the tube is shaken vigorously for an hour, opened at one end to pour a small portion into a watch-glass for counting, resealed and sterilized for an hour at 60°C. The bacteria are then counted as follows: puncture the finger to obtain a free drop of blood; take equal parts of vaccine from the watch-glass, and blood in a capillary pipet; mix by blowing back and forth several times on a slide; dilute this one-half with normal salt solution, draw up to the mark 1 in the white blood cell-counter, and fill the bulb to 11 with normal salt. The object of diluting is to facilitate the counting, the above proportion giving from 6 to 15 cells in a field. From this mixture four smears are made, by placing a small drop at one end of as many slides, and spreading with a piece of cigarette paper. The smears are fixed in 7 per cent bichlorid and stained in alkaline methylene blue only, for 1 to 2 minutes. Twenty fields on each slide are counted, marking the number of red cells in each field in one column, with the number of bacteria in the same field in another column. Both columns of figures are then added and the average proportion of bacteria to red corpuscles obtained. Considering there are five million red cells per c. mm., the following proportion is made:

Red cells: bacteria:: 5 million: x.

For instance, if there are five corpuscles and eight bacteria respectively to a field, the equation reads:

5: 8:: 5 million: x, equals 8 million per c. mm. or 8000 million per c. c. The amount of vaccine is next measured and enough normal salt solution added to make 25 or 50 c. c., according to the number of bacteria, in order to give a sufficient quantity to lysolize ¼ per cent for preservation. Knowing the number of bacteria per c. c. in the vaccine and the quantity, the thickness of organisms is easily calculated, after the additional normal salt has been added. The vaccine is now poured into a bottle and the top covered with a tight fitting rubber cap. The lysol (one minim to 25 c. c.) is added by means of a hypodermic syringe, puncturing the rubber cap with the needle. The vaccine for injections is obtained in the same way, plunging the needle through the cap, which is sterilized each time by dipping into pure lysol, and withdrawing the desired dose.

Great care must be observed in having the glassware, needles, normal salt, rubber caps, etc., sterilized just before using, to avoid contamination. After the preparation is ready for use, a few minims are withdrawn and planted on agar to see if it is sterile.

In counting, a small disc ruled with squares is inserted into the ocular of the microscope. The area within the four outer rulings constitutes a field (see Plate 2). In this way the objects are focused in the center of the lens, and no cell is counted twice and no cells are passed over without being counted.

### THE ADMINISTRATION OF VACCINE

The initial dose, under ordinary circumstances, is 500 million, the second and succeeding ones 1000 million, until the index ceases to increase by that amount. The largest dose necessary in our series so far has been 3000 million, the case being one of chronic

furunculosis. The least local discomfort comes from a small concentrated injection, more soreness and redness arising from a large bulk, containing the same number of organisms. The vaccines are, therefore, preferable containing 4000 million staphylococci per c. c., so an initial dose of 500 million will require only two minims; 1000 million, four minims, etc., a very large dose not over 20 minims. The local reaction has been slight in all cases, consisting of a small elevation with some redness and soreness. Suppuration has never occurred, and the patients never experience symptoms of general malaise or discomfort, the local reaction decreasing with each inoculation.

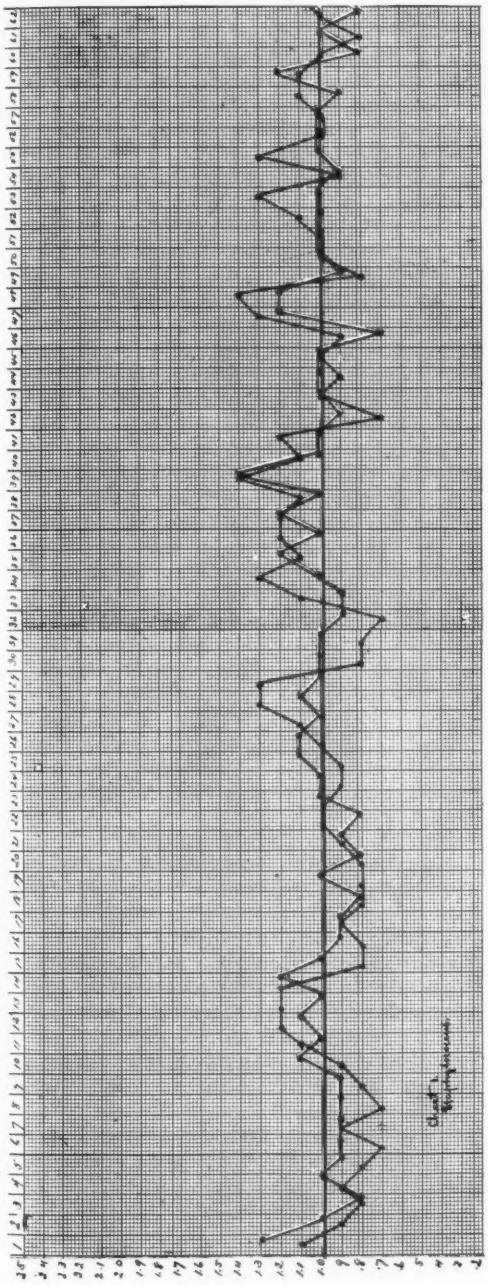


Fig. 53.

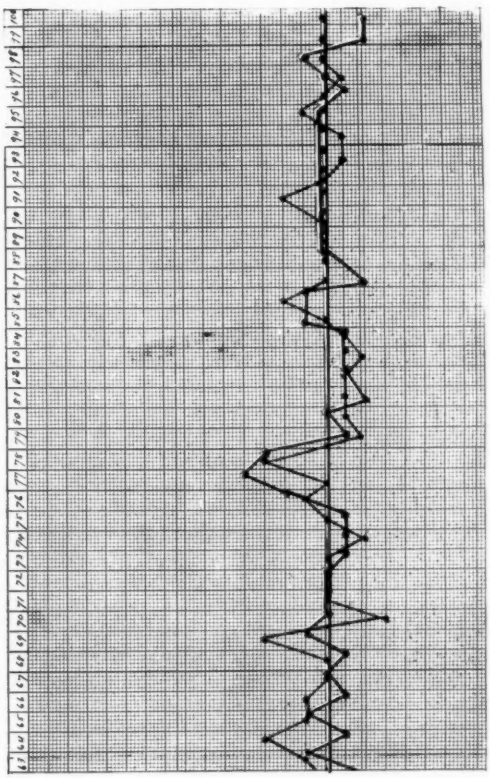


Fig. 53 (continued).

Fig. 53. Staphylococcus.
Red line denotes the phagocytic index and the black line the opsonic index of 100 persons considering themselves in good health.

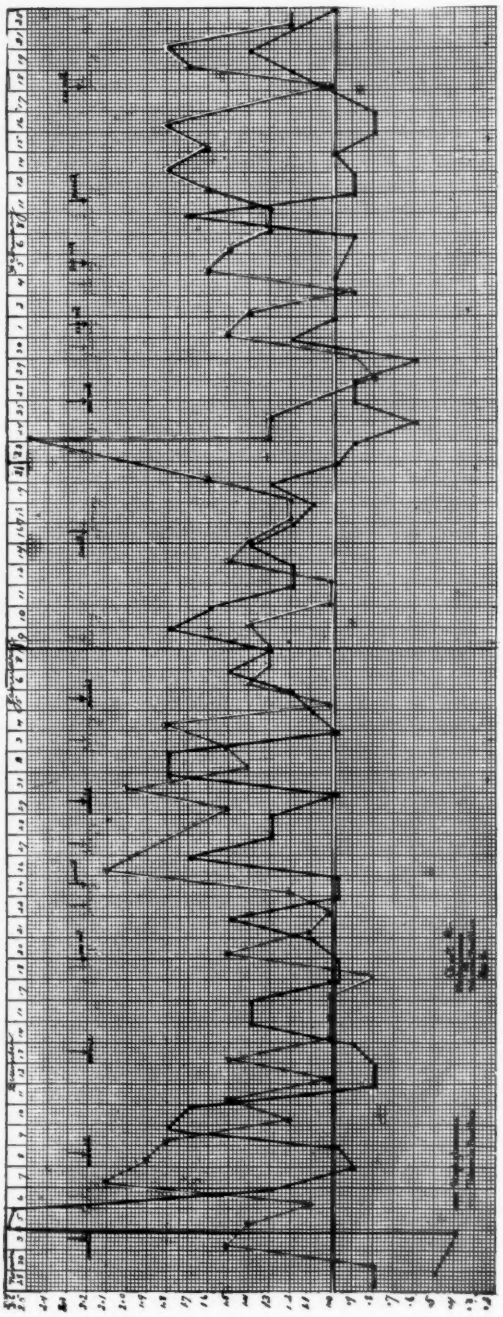


Fig. 54.

### GENERAL RESULTS OF 840 BLOOD EXAMINATIONS

*The Normal Index.* Of the 840 blood examinations that have been made, 337 were of patients with known staphylococcus infection, 26 for diagnosis where the organism was suspected, but not obtained, and 377 from a series of five normal individuals and 100 from the same number of persons considering themselves in good health, one examination each. These latter were noted for the purpose of ascertaining what a normal index is, and if we can consistently say it is 1.0.

Fig. 53. Staphylococcus shows the variation from 0.7 to 1.4, in 100 different persons, the black line denoting the opsonic index, the red line the phagocytic index. Allowing for errors in technique and considering one examination is not conclusive, this variation is not remarkably wide, the average of the whole number being 1.0 for both the opsonic index and the phagocytic index. Table 1 Staphylococcus shows the opsonic index and the phagocytic index of the series of five persons, covering a period of from 3 to 7 months, some of the counts being at intervals, others daily. The resulting opsonic average of each is 1, and of the phagocytic average is 1. Hence the index, whether opsonic or phagocytic, of persons in good health is 1.0.

### PATIENT'S INDEX BEFORE TREATMENT

In chronic cases where a few days' delay is of small importance, it has been the custom to make three examinations before treatment was started, in order to compare the indices following and to confirm the theory that persons suffering from staphylococcus infections would have a low index. This, however, has not always been the case, though the range of variation is greater and more irregular than that of normal counts, even though the average of the three may not be consistently low. See Tables 2, 3, and 4.

Fortunately a diagnosis is always made positive by isolation of the organism, which naturally would not be increasing if the resist-

Fig. 54. Red line indicates the tuberculo-opsonic index curve.
Black line indicates the staphylococco-opsonic index curve.

# TABLE I

STAPHYLOCOCCO-OPSONIC AND PHAGOCYTIC INDEX

| NORMAL G | | NORMAL J | | NORMAL H | | NORMAL K | | NORMAL L | |
|---|---|---|---|---|---|---|---|---|---|
| O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. | O. I. | P. I. |
| 1.0 | 1.0 | 0.9 | 0.6 | 0.9 | 1.0 | 1.0 | 0.8 | 1.0 | 0.8 |
| 1.0 | 1.0 | 0.8 | 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 1.0 | 1.0 |
| 1.1 | 0.8 | 1.6 | 1.1 | 1.0 | 1.0 | 1.2 | 1.0 | 1.4 | 1.1 |
| 0.7 | 1.0 | 1.6 | 1.1 | 0.9 | 1.0 | 1.1 | 1.1 | 1.0 | 1.0 |
| 1.0 | 1.6 | 1.1 | 1.2 | 1.1 | 1.0 | 0.9 | 1.0 | 0.9 | 1.0 |
| 1.3 | 1.2 | 1.1 | 1.0 | 1.2 | 0.7 | 1.0 | 1.0 | 0.8 | 1.2 |
| 1.0 | 1.0 | 1.0 | 0.9 | 1.4 | 0.8 | 0.9 | 0.7 | 1.4 | 0.1 |
| 0.9 | 1.2 | 1.0 | 1.0 | 0.9 | 0.8 | 1.5 | 1.0 | 1.0 | 0.9 |
| 1.4 | 1.0 | 1.0 | 0.9 | 1.2 | 1.0 | 0.9 | 0.8 | 1.1 | 0.9 |
| 1.6 | 1.2 | 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 0.7 | 1.0 | 0.8 |
| 0.9 | 0.8 | 1.0 | 0.9 | 1.0 | 1.1 | 0.8 | 0.7 | 0.8 | 0.7 |
| 1.0 | 1.3 | 0.9 | 1.0 | 1.0 | 0.9 | 1.2 | 1.0 | 0.9 | 1.0 |
| 1.4 | 1.1 | 0.8 | 0.9 | 1.0 | 0.8 | 0.9 | 0.8 | 1.1 | 1.0 |
| 1.1 | 1.0 | 1.1 | 1.0 | 1.0 | 0.9 | 1.2 | 1.1 | 1.2 | 1.1 |
| 0.9 | 0.9 | 1.0 | 0.9 | 1.3 | 1.2 | 0.9 | 0.8 | 1.0 | 0.9 |
| 1.0 | 1.0 | 0.7 | 0.9 | 0.9 | 0.8 | 1.0 | 0.9 | 0.8 | 1.0 |
| 0.8 | 0.8 | 1.0 | 1.0 | 1.0 | 1.1 | 1.0 | 1.0 | 1.2 | 1.3 |
| 1.0 | 1.0 | 0.8 | 1.0 | 1.1 | 1.1 | 0.8 | 1.0 | 1.2 | 0.9 |
| 0.8 | 0.8 | 1.0 | 1.0 | 1.2 | 1.0 | 1.4 | 1.0 | 1.3 | 1.1 |
| 1.5 | 1.3 | 0.9 | 0.9 | 1.0 | 0.8 | 0.9 | 1.0 | 1.2 | 1.1 |
| 0.9 | 0.9 | 0.8 | 0.9 | 1.0 | 0.9 | 1.2 | 0.8 | 0.9 | 0.8 |
| 0.9 | 1.6 | 0.9 | 0.9 | 1.1 | 0.9 | 1.1 | 1.0 | 0.9 | 1.3 |
| 0.8 | 0.8 | 0.9 | 0.9 | 1.3 | 0.9 | 1.0 | 0.9 | 1.4 | 1.3 |
| 0.9 | 0.8 | 1.0 | 1.0 | 0.7 | 0.9 | 1.1 | 0.8 | 1.3 | 1.2 |
| 0.9 | 0.1 | 0.9 | 0.9 | 0.8 | 0.7 | 1.2 | 1.3 | 1.4 | 1.0 |
| 0.7 | 0.1 | 0.9 | 1.0 | 1.0 | 0.9 | 1.0 | 1.1 | 1.0 | 1.0 |
| 1.2 | 1.1 | 1.0 | 0.9 | 1.0 | 1.1 | 1.0 | 0.9 | 1.0 | 0.9 |
| 0.8 | 1.0 | 1.0 | 1.0 | 1.1 | 0.9 | 1.3 | 1.2 | 1.0 | 0.9 |
| 0.9 | 0.9 | 1.0 | 0.9 | 0.9 | 0.9 | 1.1 | 0.9 | 0.9 | 1.0 |
| 1.2 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 1.2 | 1.2 | 0.8 | 0.9 | 1.0 | 0.9 | 1.3 | 1.1 | 1.0 | 1.0 |
| 1.3 | 1.1 | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 | 1.0 | 0.9 | 1.0 |
| 1.1 | 1.0 | 1.0 | 0.9 | 0.9 | 0.9 | 0.8 | 1.0 | 1.0 | 0.9 |
| 1.1 | 0.8 | 0.9 | 1.0 | 0.9 | 1.0 | 1.3 | 1.0 | 0.9 | 0.9 |
| 1.3 | 1.1 | 1.0 | 0.9 | 0.9 | 1.0 | 1.0 | 0.9 | 1.0 | 1.0 |
| 0.9 | 0.7 | 1.1 | 1.0 | 1.1 | 1.0 | 1.1 | 0.9 | 0.9 | 1.0 |
| 0.8 | 0.8 | 0.9 | 0.9 | 1.0 | 0.8 | 1.0 | 1.1 | 1.0 | 1.0 |
| 1.3 | 0.9 | 1.1 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 |
| 1.0 | 1.2 | 1.0 | 0.8 | 0.9 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 |
| 0.9 | 1.0 | 0.9 | 0.9 | 1.1 | 0.9 | 1.0 | 0.8 | 1.2 | 1.1 |
| 1.0 | 0.9 | 40)30.4 | 40)38.0 | 1.1 | 1.1 | 1.0 | 1.0 | 1.0 | 1.0 |
| 0.9 | 0.8 | .98=1.0 | 9.5=1.0 | 1.0 | 1.1 | 1.1 | 1.0 | 1.0 | 1.0 |
| 0.9 | 1.0 | | | 0.9 | 0.9 | 0.9 | 0.9 | 1.2 | 1.1 |
| 1.0 | 0.9 | | | 1.3 | 1.0 | 1.1 | 1.0 | 1.3 | 1.0 |
| 1.0 | 1.0 | | | 1.2 | 1.1 | 1.1 | 1.0 | 1.0 | 1.0 |
| 1.0 | 1.0 | | | 1.0 | 1.0 | 0.9 | 1.0 | 0.9 | 1.1 |
| 1.1 | 1.0 | | | 0.9 | 1.0 | 0.9 | 0.9 | 0.9 | 1.0 |
| 1.1 | 1.0 | | | 1.0 | 1.1 | 1.0 | 0.9 | 1.0 | 1.0 |
| 1.0 | 1.0 | | | 48)49.1 | 48)47.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 1.0 | 1.0 | | | 1.0 | .978=1.0 | 0.9 | 0.9 | 1.2 | 1.1 |
| 1.0 | 1.1 | | | | | 0.9 | 0.9 | 0.9 | 1.0 |
| 1.0 | 1.0 | | | | | 1.1 | 1.0 | 0.9 | 0.9 |
| 0.9 | 1.0 | | | | | 0.9 | 1.0 | 1.1 | 1.0 |
| 0.9 | 0.9 | | | | | 0.9 | 0.9 | 0.9 | 0.9 |
| 0.9 | 1.0 | | | | | 1.0 | 1.0 | 1.0 | 0.9 |
| 1.1 | 1.0 | | | | | 1.1 | 1.0 | 1.3 | 1.1 |
| 1.1 | 1.1 | | | | | 1.1 | 1.0 | 0.9 | 1.0 |
| 1.0 | 0.8 | | | | | 0.9 | 1.0 | 1.3 | 1.0 |
| 1.1 | 1.1 | | | | | 0.8 | 0.9 | 1.1 | 0.9 |
| 1.2 | 1.1 | | | | | 1.0 | 1.0 | 1.0 | 1.0 |
| 1.0 | 0.9 | | | | | 0.9 | 0.9 | 1.0 | 1.0 |
| 0.9 | 1.0 | | | | | 0.9 | 1.0 | 1.0 | 0.9 |
| 1.0 | 1.1 | | | | | 0.9 | 1.0 | 1.0 | 1.0 |
| 1.0 | 1.0 | | | | | 1.0 | 1.0 | 1.1 | 1.0 |
| 1.0 | 1.0 | | | | | 1.0 | 0.9 | 1.0 | 1.0 |
| 1.1 | 1.0 | | | | | 1.1 | 1.1 | 1.0 | 1.0 |
| 1.0 | 1.0 | | | | | 1.1 | 0.9 | 1.0 | 1.0 |
| 1.2 | 1.0 | | | | | 1.1 | 1.1 | 1.2 | 0.9 |
| 1.2 | 0.8 | | | | | 1.0 | 1.0 | 1.1 | 1.0 |
| 1.0 | 0.9 | | | | | 0.9 | 1.0 | 1.0 | 1.0 |
| 1.2 | 1.0 | | | | | 0.9 | 1.1 | 1.0 | 1.0 |
| 1.1 | 1.0 | | | | | 0.9 | 0.9 | 0.9 | 1.0 |
| 1.1 | 1.0 | | | | | 0.9 | 1.0 | 1.0 | 1.0 |
| 1.0 | 0.9 | | | | | 1.0 | 0.9 | 1.0 | 1.0 |
| 1.0 | 1.0 | | | | | 0.9 | 1.0 | 0.9 | 1.0 |
| 1.1 | 1.0 | | | | | 0.9 | 1.1 | 1.2 | 1.1 |
| 1.2 | 1.0 | | | | | 0.9 | 0.9 | 76)79.3 | 76)76.3 |
| 0.9 | 0.9 | | | | | 0.9 | 0.9 | 1.0 | 1.0 |
| 1.1 | 1.1 | | | | | 1.0 | 1.0 | | |
| 1.0 | 1.0 | | | | | 1.1 | 1.1 | | |
| 1.0 | 1.0 | | | | | 1.1 | 1.1 | | |
| 1.0 | 0.8 | | | | | 0.9 | 1.0 | | |
| 1.0 | 1.1 | | | | | 0.9 | 0.9 | | |
| 1.0 | 0.9 | | | | | 1.0 | 1.0 | | |
| 0.9 | 1.0 | | | | | 84)85.8 | 84)81.0 | | |
| 1.0 | 1.1 | | | | | 1.0 | .964=1.0 | | |
| 1.0 | 0.9 | | | | | | | | |
| 1.0 | 0.0 | | | | | | | | |
| 88)91.6 | 88)85.4 | | | | | | | | |
| 1.0 | .97=1.0 | | | | | | | | |

In all calculations five or more tenths are valued as 1.; 50 or more hundredths as .1, etc.

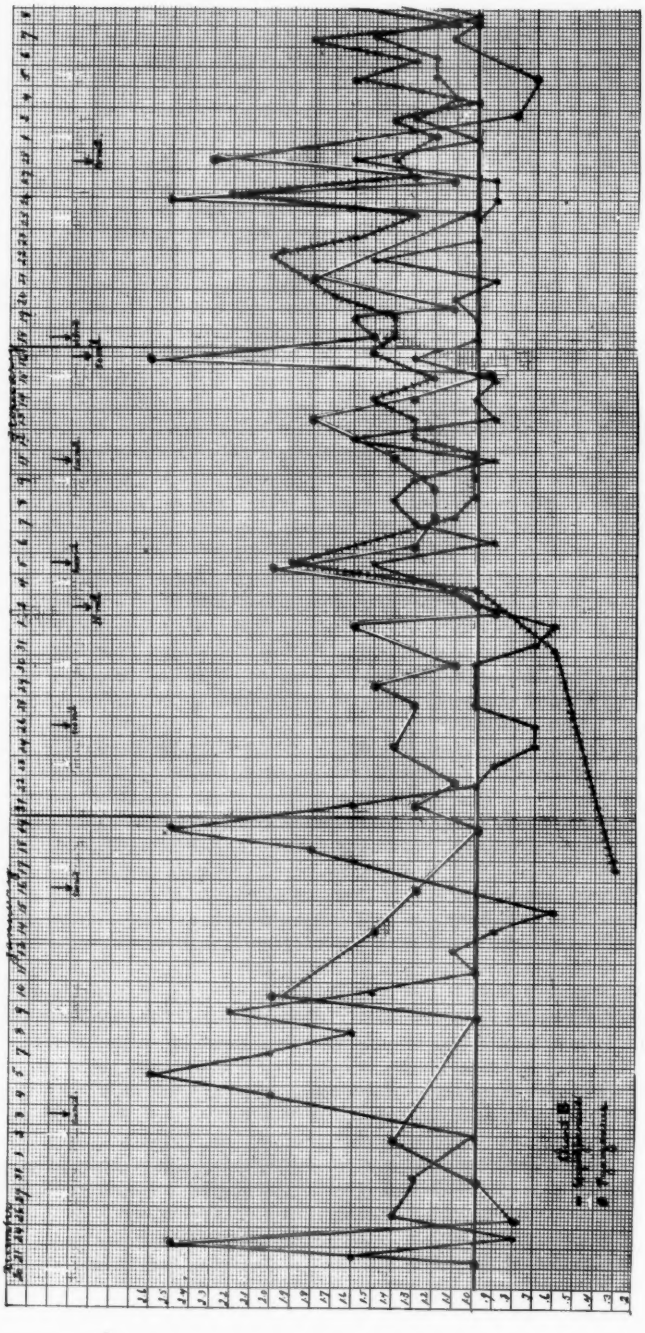


Fig. 55. The red line indicates the index for the tubercle bacillus, the black the staphylococcus, and the cross line the pyocyaneus.

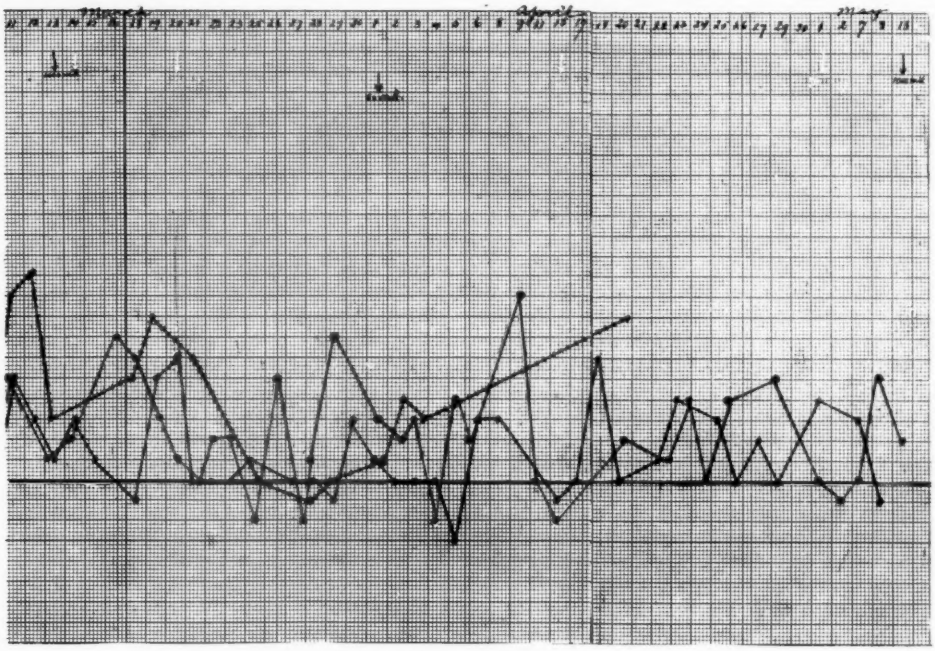


Fig. 55 (continued).

ance of the patient were not below par. Hence, no matter what the index, if the lesion is spreading, is it not reasonable to say that treatment is indicated, to increase the opsonins which are not sufficient in quantity to overcome the invasion?

The simplicity of the diagnosis is a great advantage over other obscure internal infections, rendering the treatment and cure of acne, furuncles, and abscesses by the opsonic method most satisfactory, the improvement being actually visible from day to day in case of boils, and from week to week in case of acne.

TABLE 2

Three Indices for Diagnosis Before Treatment

| Case 8. | Case 9. | Case 5. | Case 11. | Case 12. | Case 16. |
|---|---|---|---|---|---|
| 1.4 | .7 | 1.6 | .6 | .9 | 1.0 |
| .8 | .7 | .8 | .8 | 1.1 | .8 |
| .9 | .8 | 1.4 | .9 | 1.2 | 1.2 |
| 3)3.0 | 3)2.2 | 3)3.80 | 3)2.3 | 3)3.2 | 3)3.0 |
| 1.0 | .7 | 1.26 = 13 | .7 | 1.1 | 1.0 |

TABLE 3

One Index Before Treatment

| | | | | | |
|---|---|---|---|---|---|
| Case 20, | .9. | Case 15, | .7. | Case 23. | .7. |

TABLE 4

Three Successive Examinations Taken at Random from Series of Five Normal Persons

| G. | J. | H. | R. | L. |
|---|---|---|---|---|
| 1.0 | 1.1 | 1.0 | 1.0 | 1.0 |
| 1.0 | 1. | 0.9 | 1.1 | 1.0 |
| 1.0 | 1. | 1.0 | 1.0 | 1.0 |
| 3)3.0 | 3)3.1 | 3)2.9 | 3)3.1 | 3)3.0 |
| 1.0 | 1. | .96 | 1. | 1.0 |
| .9 | 1.0 | 1.1 | 1.0 | 1.0 |
| .9 | 0.9 | 1. | 0.9 | 1.0 |
| 1.1 | 1.0 | 1.1 | 0.9 | 1.2 |
| 3)2.9 | 3)2.9 | 3)3.2 | 3)2.8 | 3)3.2 |
| .96 | .96 | 1.1 | .9 | 1.1 |

### PATIENT'S INDEX AFTER TREATMENT

The next question is, What is the index after inoculation? Tables 5, 6, 7, and 8, which correspond to Figs. 27, 29, 30, 31, respectively, show the changes. These tables are not as accurate as though examinations had been made daily, which was impossible, owing to the inability of patients to report at the laboratory systematically, delay in receiving mailed blood specimens, etc.

The general conclusions are, that the index rises highest at the beginning of treatment, reaching the maximum point on the second and third days after inoculation, remaining so

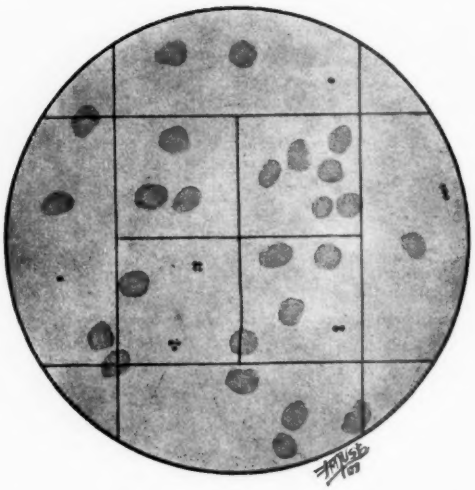


Plate 2. Field showing smear of red corpuscles and staphylococci in method for counting vaccines.

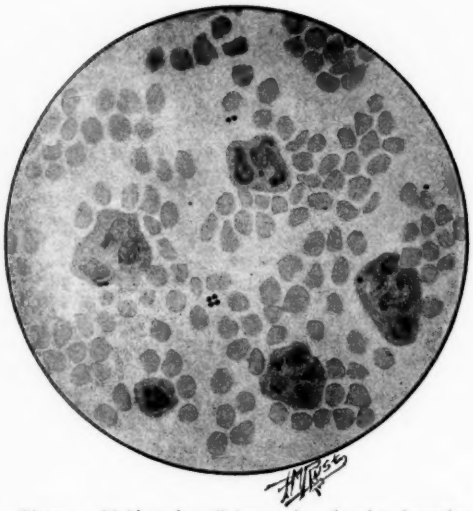


Plate 3. Field under oil immersion showing ingestion of staphylococci by the leucocytes.

for one day only and gradually dropping; that the dose must be gradually increased to produce a rise; that injections are indicated according to the fall of index every seven to nine days, giving an injection preferably when it reaches 1.1 or 1.0; that the number of doses in acute cases varies from 2 to 4 to affect a cure, while in chronic acne cases it requires five or six before the softening of the skin, lessened inflammation, etc., begin to be apparent.

TABLE 5

Case 17. See Chart Staphylococcus No. 17.

| No. of Injections. | Dose | No. days between injections. | No. exams. between injections. | Highest index after injections. | Day index is highest after injection. | Lowest index before injection. |
|---|---|---|---|---|---|---|
| 1 | 1000 million | 5 | 2 | 1.3 | 4 | 1.1 |
| 2 | 1000 million | | 3 | 1.6 | 5 | 1.1 |

TABLE 6

Case 11. See Chart 11.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 1000 million | 5 | 2 | .9 | 5 | .9 |
| 2 | 1000 million | 15 | 6 | 1.5 | 9 | .0 |
| 3 | 1000 million | 11 | 3 | 1.3 | 3 | .8 |
| 4 | 1125 million | 11 | 6 | 1.4 | 4 | .8 |
| 5 | 2250 million | 12 | 4 | 1.3 | 1 | .8 |
| 6 | 2800 million | 9 | 3 | 1.5 | 4 | .8 |
| 7 | 2800 million | 10 | 2 | 1.3 | 5 | 1. |

### TREATMENT OF MIXED INFECTIONS

In two cases of mixed infections the germs have been isolated and vaccines made from each, the phagocytic power being determined separately and inoculations given when indicated by the drop of the index.

That the opsonins are specific is readily seen by comparing the different curves. The index for one is often low while that of the other is high, showing the inoculation of one vaccine does not increase the opsonins towards the other organisms. Fig. 54 shows a combination of staphylococcus and tubercle bacillus, the

TABLE 7

Case 12. See Chart 12, Staphylococcus.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 500 million | 12 | 6 | 1.5 | 4 | 1.3 |
| 2 | 1000 million | 8 | 6 | 1.4 | 3 | .7 |
| 3 | 1250 million | 7 | 4 | 1.5 | 2 | .8 |
| 4 | 1800 million | 7 | 3 | 1.5 | 1 | 1.1 |
| 5 | 2500 million | 7 | 3 | 1.3 | 2 | 1.0 |
| 6 | 3000 million | 9 | 3 | 1.3 | 5 | .9 |
| 7 | 3000 million | 5 | 2 | .9 | 3 | .9 |

TABLE 8

Case 9. See Chart 9, Staphylococcus.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 1000 million | 14 | 3 | 1.3 | 10 | 1. |
| 2 | 1000 million | 15 | 3 | 1.2 | 6 | 1. |
| 3 | 2000 million | 27 | 8 | 1.3 | 14 | .7 |
| 4 | 2100 million | 8 | 4 | 1.5 | 4 | .9 |
| 5 | 2100 million | 8 | 2 | 1.3 | 2 | 1.1 |
| 6 | 2100 million | 7 | 2 | 1.1 | 2 | .8 |
| 7 | 2500 million | 8 | 2 | 1.5 | 2 | 1. |
| 8 | 2500 million | 8 | 2 | 1.4 | 1 | 1. |
| 9 | 2500 million | 7 | 2 | 1. | 3 | .9 |

vaccines for each having been given independently until cultures showed an absence of staphylococci, when the staphylococcus vaccine was discontinued.

Fig. 55 shows another case of tubercle, staphylococcus and pyocyaneus infection, the three separate vaccines having been given as in the other case. After four months the pyocyaneus could not be isolated, the pus losing the green color produced by that organism, so the pyocyaneus vaccine was discontinued.

The importance in mixed infections of isolating each organism and making a separate vaccine cannot be too strongly emphasized. Owing to the different manner and rapidity with which different organisms multiply, it is very evident that when grown together, one will far outnumber the other, and the desired dose of both cannot be administered from the same mixture. Also, if streptococci and staphylococci are grown together to make a mixed vaccine, after an hour's vigorous shaking to break the clumps sufficiently to count, how would it be possible to distinguish between the two? The sterile colon bacilli, when injected, often produce a very disagreeable reaction, hence great care must be exercised in the use of colon vaccine; twenty-five to fifty million being an initial dose, 200 million being the maximum. This amount of some organisms is a very small dose, so if the two were grown together either an overdose of the colon would be given or an inadequate dose of the other organism. Also, when the index of one indicated it was time for another inoculation, it does not necessarily follow that the other index would be low enough too, to warrant a repetition of vaccine at that same time.

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# HYSTERECTOMY FOR HEMORRHAGE

## Report Of A Case Of Vaginal Hysterectomy For Uncontrollable Uterine Hemorrhage Due To Pregnancy Changes At The Placental Part Of The Uterus

By GEORGE C. WAISS, M. D.
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AFTER labor, as well as after abortion, large or small parts of placental tissue can be retained in the uterus, and in some instances the entire placenta can be retained after an incomplete abortion.

Whenever we have such retention of placental tissue, no necrotic change will take place, providing there has been no infection (1).

According to Mertens and Graffe, the fetal structures receive their nutrition from the maternal "Saftstrom" and can retain an almost normal appearance for many months (2).

That the retention of such fragments of placental tissue can produce changes at the placental part of the uterus, accompanied by hemorrhage of an alarming nature, the following case will illustrate:

Mrs. K., aged 41, housewife, family history of no especial interest, has been married twenty years, had seven children and three miscarriages. Menstruation began at 17 years. It has always been regular, of the 28 day type, and of five days' duration. The quantity was always moderate up to about four years ago.

At this period she had an abortion which was accompanied by an infection. After this she menstruated every three weeks and the duration was from six to seven days. The quantity of blood was also increased. This continued up to September, 1905, at which time she flowed but one day and stopped, only to start again two days later and then stopped entirely for six weeks. At this period she menstruated profusely for two weeks without any interval, but gives no history of an abortion having taken place. This hemorrhage continued off and on up to January, 1906, at which time I was summoned rather hurriedly to her home and found her in an unconscious condition due to a uterine hemorrhage. Vaginal examination showed a large, soft uterus. The cervix was rather firm, but dilated to about the size of a little finger. Abortion was diagnosed. The vagina was tightly packed with iodiform gauze and stimulation was freely administered. The patient rallied quickly, and the next day an attempt was made to empty the uterus. This, however, proved a failure on account of the severe hemorrhage which followed the introduction of the curette for exploratory purposes. The hemorrhage was of a severe character and was controlled with great difficulty. That night the patient's tempera-

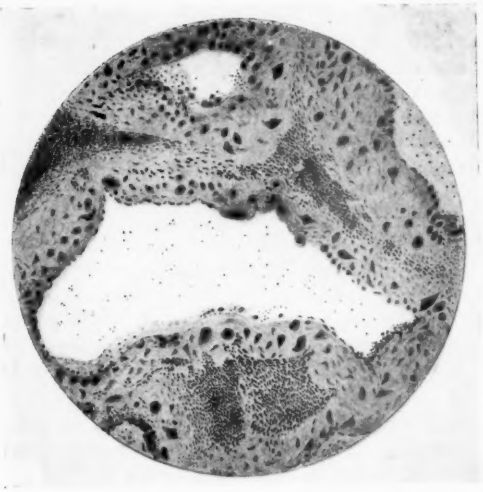

Fig. 1. Drawn with Abbe Camera lucida. (Low Power.) Showing strange cells of all sizes and shapes around the wall of the blood-vessels.

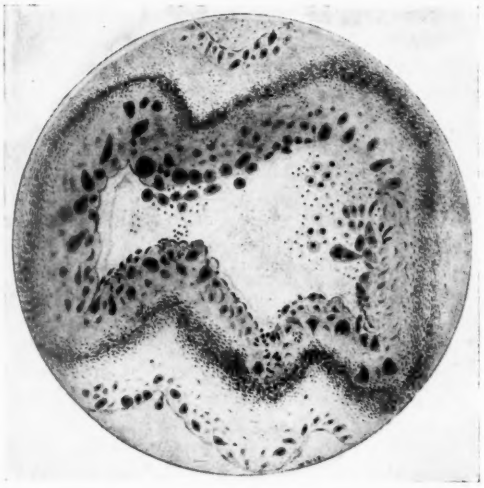

Fig. 2. Drawn with Abbe Camera lucida. (Medium Power.) Showing strange cells around the wall and within the blood-vessels.

ture arose to 104, her pulse to 160 and very weak. Respiration was rapid and sighing. In fact her condition was so extremely poor that no hope for recovery was entertained.

She rallied, however, although somewhat slowly, her temperature gradually going down to normal. Her pulse remained weak and rapid. The flow never stopped entirely and the vagina had to be packed almost daily. She was now removed to St. Anthony's Hospital; her condition upon entering being the following:

Temperature, 100, pulse 100 and weak. Face and mucous membrane pale. Heart and lungs normal, liver normal. No enlargement of the spleen could be made out. Urine, specific gravity 10:16, no sugar, trace of albumen, but no casts. The blood findings were, reds, 2,800,000; whites, 11,500; hemoglobin, 40 per cent.

On February 8th the uterus was removed per vagina. One ovary was retained. There was nothing of special interest following the operation. The patient made a slow but steady recovery. I examined her last month, one year after the operation. She says she now feels strong and well. Her appearance has changed and she has gained considerably in weight and strength. Examination per vagina proved negative.

The uterus on removal measured 13½ cm. in length, 7½ cm. in width, and in external appearance did not differ from any other pregnant uterus at an early stage.

The ovary which was removed was cystic and measured 6 cm. by 3 cm. The tube appeared to be normal.

Upon opening the uterus a large piece of placental tissue was found adherent to the anterior wall of the uterus. This piece did not seem to be attached very firmly, as it came away with slight traction. The entire specimen was placed in 5 per cent Formalin, after which a large number of small pieces were removed from the placental part of the uterus, also some pieces from the non-placental part. Numerous pieces were taken from the different parts of the placental tissue, also some from the ovary and tube. These were gradually hardened in alcohol of increasing strength so as to avoid shrinkage as much as possible. For imbedding, cellodion was used.

For general staining purposes Hematoxylin and Eosin and Hematoxylin and Orange were used. To demonstrate the presence of elastic tissue, Wigert's Elastic Tissue Stain alone and in combination with Lithia Carmine was used. In the attempt to demonstrate plasma cells, Unna's Polychromine Methylin Blue with glycerin was employed.

*Microscopical Examination.* Very little change could be demonstrated in the chorionic villi. The syncytium seems to be in a remarkably well preserved condition. The nuclei take a rich dark stain. The protoplasm also stain well. Langhans' Layer appears to be present to a normal extent. Some of the villus appear to be rather large, but no change can be demonstrated in the epithelial layer. The connective tissue of the chorionic membrane appear to be normal, no fibrous or hyaline degeneration can be found.

The decidual cells present take a very faint stain. Some of the cells are in a state of degeneration. Of great interest are the large number of deeply staining cells found in the decidua. They are mostly round or cubical in shape. The nuclei are very large, single or multiple and stain very dark. These cells are no doubt trophoblasts and can easily be differentiated from the

Fig. 3. Drawn with Abbe Camera lucida. (High Power.) Small and large epithelial-like cells and multi-nucleated giant cells found in the wall and the lumen of blood-vessels.

more faintly staining decidual cell with its light staining vesicular nuclei. I was not able to demonstrate any plasma cells in the decidua (3).

*Placental Part of Uterus.* Examination of sections taken from the placental part of the uterus show a great number of large blood vessels. Some of these blood-vessels are tortuous and lie close together. The greater part of the wall of these vessels are undergoing a hyaline change. These vessels are mostly in the superficial part of the muscular wall and extend down about 5 mm.

Examination of the blood-vessels situated deeper in the muscularis show no such degenerate change. The walls of these degenerated vessels are invaded by a large number of heterogeneous cells, and in some instances these cells are found in the lumen of the vessels.

In staining these sections with Wigert's Elastic Tissue Stain, they show an absence of elastic tissue. According to Pick (4) the elastic tissue fibre in the uterine muscle and uterine blood-vessels varies in its amount and in its form at different periods of life, and in different diseases. In this case we have almost an entire absence of elastic tissue around the blood-vessels which are invaded by these strange cells. Some of the vessels show the presence of elastic tissue in small amount. There is also a great diminution of elastic tissue throughout the musculature as well as around the blood-vessels in the vascular layer, where we usually find elastic tissue present in large clumps in the multiparous uterus. No doubt the absence of elastic tissue in the wall of these degenerated vessels, as well as the diminution in the remaining part of the muscularis, plays an important part in the production of hemorrhage, as the vessels have lost all power to contract and remain open, similar to a flaccid tube.

The heterogeneous cells found in these degenerated vessels vary in size as well as in number. They are seen to possess all sizes and all sorts of shapes. Some are small and round, some larger, polygonal, spindle-shaped, large epitheloid, and some which do not seem to possess any shape whatever, or they are so ill defined that no decided shape can be outlined. They appear to be blurred. A number of multi-nuclear giant cells are also present.

Some of the large epithelial-like cells lay in large num-

Fig. 4. Drawn with Abbe Camera lucida. (High Power.) Large and small epithelial-like cells penetrating a blood-vessel.

bers in the wall of the degenerated blood-vessels and in some instances they replace the endothelial lining of the vessel wall entirely. We also find these cells lining the wall of some blood-vessels in large numbers on one side only, while the other side shows an almost normal condition of the endothelium. In some instances the cells have penetrated the vessel wall by gradually breaking through the endothelial lining and thus gaining access to the interior of the blood-vessel. When the cells are found in the lumen of a vessel, they appear mostly in small groups and are surrounded by a layer of fibrin and leucocytes.

Some of these epithelial-like cells are very large, measuring 1/24 mm. Others again are smaller, about 1/50 mm. The protoplasm is of a granular character and takes the stain well. The nuclei are also of a granular nature and stain rather dark. In some of the larger cells, nuclear fragmentation is taking place. The smaller cells resemble the trophoblast cells found in the decidua, both in size as well as in shape. They also react similar in their staining capacity. Both protoplasm as well as nuclei take the stain readily. The multinuclear giant cells found in the blood-vessels, as well as in the vessel wall, are of different sizes and shapes. One of these cells measured 1/12 mm. and showed eleven distinct nuclei. This was the largest of the giant cell variety that I could find. Others with from three up to seven nuclei were more frequent. A large number of cells which resemble giant cells are also present, but their protoplasmic outline is lost on one side, and it cannot be said with any degree of certainty that these cells are giant cells. They may be a number of cells crowded together, or it may be due to some mechanical interference in the cutting of the section. The multinuclear giant cells resemble those which are found in some cases of tubal pregnancy, with this exception: the cells found in tubal pregnancy are always of a fresher appearance; they possess more life. Their protoplasm as well as their nuclei take a darker, polished stain. The cell outline is of a decided nature. On the other hand, the cells which are found is this case do not stain so well, and in a great many instances they assume a blurred appearance. Others again seem to be disappearing entirely. The protoplasm as well as the nuclei can only be recognized with great difficulty. In other words, we are dealing with a cell which is undergoing a degenerative change. The cell is in a dying condition.

*Non-placental Part.* Examination of sections taken from the non-placental part of the uterus show no such change as just described, and at no time was I able to demonstrate the presence of any decidual tissue. Some of the glands appear to be of normal size. Their glandular epithelium was not altered to any extent. Other glands, however, appeared dilated and their glandular epithelium appeared to be flattened. The inter-glandular tissue had lost its embryonic type and was replaced by more or less fibrous connective tissue, accompanied in part by a marked round cell infiltration.

*Ovary.* The ovary showed a small cystic degeneration, otherwise it appeared to be normal.

*Tube.* No change was found in the tube, which appeared to be normal.

### REMARKS

I have drawn your attention to the similarity between the trophoblast cells found in the decidua and these epithelial-like cells found around as well as in the lumen of the vessels, and in some of the sections I was able to trace these cells from the decidua down to the blood-vessels. To say, with any degree of certainty, that the cells found in this case are of fetal, and not maternal origin, would be unwarranted. The strongest point in favor of the fetal origin lies no doubt in the demonstration of the multinuclear giant cells which are found along the vessel wall, as well as within the same. (5)

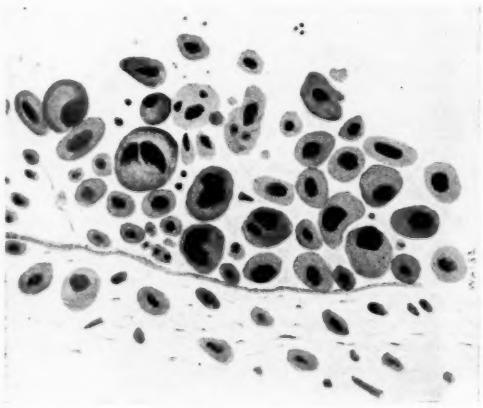

Fig. 5. Drawn with Abbe Camera lucida. (High Power.) Large cells within the lumen of a blood-vessel showing nuclear fragmentation.

Robert Meyer very recently demonstrated fifty micro-photographs of benign chorio-epithelial cell-invasion in the wall of the uterus and tubes. The cells described by him are of the same heterogeneous character as found in this case. He comes to the following conclusion:

The strange cells in the wall of the blood-vessel, as well as in the musculature of the uterus, are never of maternal, but always of epiblastic chorio-epithelial origin. He considers these cells as descendants of the Langhans' cells, very rarely from the syncytium. The differentiation of the two cells is superfluous, as single cells can also originate from the syncytium. He could follow these cells by serial sections from deep in the musculature up to the mucosa, and often up to the chorionic villi. The simple demonstration of these cells in the presence of retained chorionic villi, even in cases accompanied by invasion of the muscularis and the interior of the blood-vessels, are of no clinical significance. It is, therefore, absolutely necessary to demonstrate the presence of chorionic villi, or to be sure of their absence in all particles that have been expelled or obtained through curettage, before one considers the possibility of a malignant chorio-epithelioma.

Read before the Douglas Park Branch of the Chicago Medical Society.

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# A CASE OF "PUGILIST'S EAR"

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INJURIES of the auricle resulting in deformity are not infrequent. They are especially frequent among pugilists, who are exposed to severe blows on the organ. Deformity of the ear received in the prize ring is so often met with, and is so characteristic, that it is known familiarly among pugilists as the "tin ear."

The subject of the operation herewith recorded, a "professional," now retired, thirty-three years of age, was the hero of a number of "bruising battles," in several of which, he stated, his left ear was beaten into a shapeless mass. On each occasion the traumatism produced deformity, until finally the affected ear presented the appearance described below.

On examination I found the auricle greatly distorted and thickened, the concha and auditory meatus being filled with cartilaginous tumors of almost the density of bone, the auditory canal being completely occluded by a tumor of the size of a large hazel nut. The average thickness of the auricle was about three-fourths of an inch. I proposed operation for the relief of the deformity, which was consented to. The case required operation at five séances. Each operation consisted in a subcutaneous resection of the cartilaginous overgrowth, with due regard to the normal anatomic configuration of the auricle. Care was taken not to cut away too much of the hyperplasic cartilage at any of the several operations, it being considered wiser to allow healing on each occasion in order to determine just how much tissue should be cut away to secure the desired cosmetic effect.

The result of the operation was very satisfactory, as may be seen from Fig. 2. The deformity is now so slight as not to be noticeable save on close inspection and comparison with the opposite ear.

I have rarely experienced such gratitude as my patient exhibited. The condition had been pronounced by competent authority irremediable, and the young man had reconciled himself to a deformity which was not only conspicuous but physically annoying.

Hyperplasic chondritis or perichondritis is

Fig. 1. Photograph showing enlargement of ear before operation.

Fig. 2. Photograph of patient after operation.

the point of departure of such cases of deformity as the foregoing. It consists of an inflammation of the cartilage of the auricle, involving the integument and connective tissue and accompanied by an effusion of serum, blood or pus, eventuating in deformity or running its course without deformity. The extent of deformity depends on the degree of the inflammatory process and the nature of the treatment. Inflammation of the cartilage of the auditory canal sometimes results from multiple abscesses which have followed a sinuous course in the auricular tissue and terminated in chondritis or perichondritis. Knapp cites a case of otitis media perforativa complicated by perichondritis. Cases of serous perichondritis appearing on symmetric parts have been described. It has been known to follow the operation of opening the accessory cavities of the middle ear in chronic otitis media suppurativa. Possibly the first case of perichondritis was reported by Chimani, (Arch. für Ohrenheilkunde, vol. ii, p. 171).

A soldier suddenly experienced pain and heat in the left auricle accompanied by great swelling of its concave surface. Shortly after entering the hospital the auricle was converted into a shapeless mass by the inflammation. Poultices were applied and three days later distinct fluctuation appeared. Following an incision a large quantity of synovial-like fluid mixed with pus was evacuated. Subsequent treatment was that of an abscess, with packing, draining and the application of a bandage compress and within two weeks the auricle had assumed its normal shape and proportions. This case was considered a primary inflammation of the perichondrium, essentially an inflammation with exudation. It is readily distinguished from a vascular tumor by the absence of a bluish red color and its characteristic contents. St. John Roosa reported a similar case in the Archiv für Ohrenheilkunde in 1873. Pomeroy also reported a case, (Transactions of the American Otologic Society vol. ii, p. 83,) which is to be classed as a secondary inflammation of the auricular cartilage. It resulted from extension of inflammation from the external auditory canal.

It may be well to note the fact that there is occasionally noticeable swelling of the auricle accompanying acute inflammation of the middle ear, which, however, disappears after the subsidence of the inflammation in the tympanic cavity and its contiguous structures. Knapp has mentioned several cases of this type, some recovering with, others without deformity. (Archives of Otology, vol. ix, p. 196). Pooley reported a case (Med. Record, 1881), which was secondary to a furunculosis of the auditory canal, but these cases are very rare. Kipp

(Med. Record, 1873) reports a case of perichondritis of the auricle under the caption of spurious othematoma of both ears, the result of a burn. Cases have been noted that developed cheesy and calcareous degeneration of the cartilage. Knapp noted (Archives of Otology, 1890) in a young woman of 22 years a true ossification of the auricle following a purulent perichondritis. A tubercular type of perichondritis has been described. Several cases of sero-purulent perichondritis have fallen under my own observation which culminated in recovery with slight or no deformity, as a result of evacuation of the serous exudate followed by pressure.

The treatment in all such cases should be the timely institution of antiphlogistic measures. The ice-bag and early incisions of the fluctuating tumor under antiseptic precautions, appropriate drainage and a firm compress and bandage or collodion dressing applied. Free punctures and injection of equal parts of a solution of Tr. Iodin and alcohol have been of service. Massage has been advised. Frequent puncture and aspiration is sometimes successful. In brief, perichondritis of the auricle merits the same treatment in the early stages as would be accorded to cases of othematoma or hematoma auris. When the case has run its course, if deformity is noticeable appropriate surgical measures, plastic or otherwise, are necessary to rectify the malformation. Cases of perichondritis are so closely allied to othematoma in many of its pathologic characters that it would appear that the following predisposing factors should be taken into consideration.

1. Degeneration of cartilage.
2. Softening and fissure formation.
3. Formation of cavities with gelatinous homogenous contents.
4. Proliferation of blood-vessels.
5. New growths.
6. Trauma.

In such cases as the one herewith reported, traumatism, followed by inflammation and hyperplasia of cartilage alone is probably responsible for the condition. How much individual predisposition may have to do with it in any given case would, of course, be difficult to say.

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# APPENDICITIS COMPLICATING THE PUERPERIUM[1]

## Including a Review of the Literature of Reported Cases

By David C. Hilton, A. M., M. D., Lincoln, Nebraska

APPENDICITIS during gestation is recognized as a clinical situation of special interest. Numerous case reports and memoirs indicate that women who have had appendicitis are more prone to recurrent attacks during this period, that it is considerably more fatal than at other times, and that gestation must not be construed as a contra-indication to radical operation in this instance.

Appendicitis following childbirth, however, has not received the consideration it merits. The number of cases occurring during the puerperium is undoubtedly less than during pregnancy, in that the former is a period of days, and the latter a period of months. That a great portion of the actual cases of post-partum appendicitis have been overlooked is apparent because all of the known cases have been reported since 1893 and about one half of these since 1902; and also because the whole clinical picture is masked by the peculiar periappendicular conditions and the symptom-complex, incident to childbirth and the puerperium.

That a direct causal relation often obtains between the two conditions when they occur together, is possible from an anatomic and physiologic standpoint and altogether probable from a critical study of the reported cases. The principal anatomic relations between the inter-

[1]Read before the Nebraska State Medical Association, May 8, 1907.

nal genitals of the female and the vermiform appendix subsist in the displacement and contiguity of these organs during parturition and the puerperium, in the presence of the appendiculo-ovarian ligament or its homologue, in the aberrant course of the ovarian vessels beneath the cecum in some instances, and in the continuity of peritoneum and subperitoneal cellular tissues with their anastomosing vascular and lymphatic channels spreading over the space intervening between the organs. Such anatomic relations undoubtedly invite an inflammatory process in the one region to extend into the other.

To appreciate the anatomic relations, especially as they pertain to the appendiculo-ovarian ligament, and the course of the ovarian vessels and lymphatics, attention must be paid to the embryologic development of these structures. This ligament marks a portion of the path followed by the ovary and its vessels in the descent from their original position high up near the kidneys. The spermatic vessels, lymphatics, and nerves are the essential content and substance of this fold. The cecum and appendix also descend from the region of the liver and right kidney and follow the same path as taken by the ovary. Consequently the vascular channels running upward and outward in the suspensory ligament of the ovary often lie close to the appendix.

It is apparent from the foregoing statements that the embryologic development and surgical anatomy of the involved region is reasonably well understood. But a knowledge of the surgical pathology of the parts with reference to this clinical condition is meager, because it is gathered from actual cases, and those reported are few.

In all there are twenty-nine reported cases having their incipiency during the puerperium, including the one reported by the author. Of these, twenty-two began within ten days following full term delivery, and one within the same interval following an abortion. Six cases occurred from twenty days to eight weeks after labor. Aside from these twenty-nine cases there are a few reported as appendicitis during the puerperium that had their beginning during the parturient act. Appendicitis, so occurring, overlaps the puerperal state, but its exciting cause is coincident with pregnancy or parturition and not with the puerperium. Therefore they must not be counted among those developing during the latter period.

The principal features suggesting a relation between the puerperal state and the etiology of appendicitis complicating it, are revealed by a study of the interval elapsing between parturition and the onset of the attack, and by a review of the pathologic conditions found at operation or autopsy. Of the twenty-three cases developing within ten days following parturition, the interval is stated by days in twenty-one instances. Fourteen cases or $66\frac{2}{3}$ per cent of all developed on the second, third, or fourth day following labor, and seven cases or $33\frac{1}{3}$ per cent of all developed on the second day. The remaining seven cases are scattered along between the fourth and the tenth day, there being not more than two cases reported on any one of these days. Of the six cases developing after the tenth day, the earliest is reported on the twentieth and each case started on a different day, the latest being reported on the fifty-sixth. All of these six cases had their beginning so remote from parturition that they have little value in a study of the interval. It is very significant of an etiologic relationship between the puerperal state and the development of appendicitis, that of twenty-one cases whose time of development within the first ten days following labor is given, $66\frac{2}{3}$ per cent develop between the 2nd and the 4th day, 50 per cent of the latter or $33\frac{1}{3}$ per cent of all developed on the 2nd day, only one developed on the first day, and of the remaining $33\frac{1}{3}$ per cent developing after the 4th day, not more than two appeared on any one day. These facts are graphically represented on the subjoined chart.

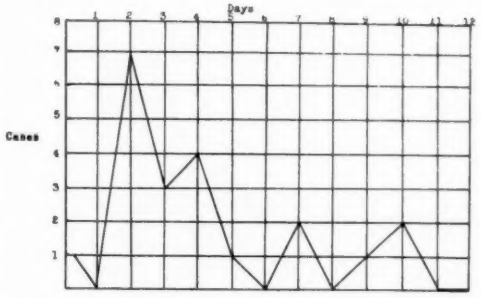
If the essential causes of appendicitis complicating the puerperium are originated or aroused to activity by circumstances peculiar to parturition or the postpartum, very few cases would be recognized clinically within the first twenty-four hours after labor, because it ordinarily requires an interval of several hours for a hidden inflammatory process to create marked symptoms, and because pain and tenderness over the lower abdomen is common at this time. Accordingly, only one of the twenty-

one cases was observed during the first day. But, on the other hand, these etiologic circumstances would undoubtedly be most prolific of morbidity within a few days after parturition, and rapidly subside in potency as the tissues and organs resumed their usual relations. Accordingly, over two thirds of the twenty-one cases developed during the first four days. If this resumption is interfered with by the lighting up of an infectious process in the genitals, some of the causes may be rendered active again and precipitate an attack late in the puerperium or following it. In two of the six cases incident after the twentieth day post partum, infected placental remains were not removed until the attack or shortly before it. In only one of the six cases are the uterine adnexia stated to have been healthy.

A study of the surgical pathology at operation and at autopsy supports the view of a causal relationship between the puerperal state and complicating appendicitis, in a large percentage of cases.

It is not necessary that the genitals transmit infection to the appendix in order to induce an attack. They may act mechanically as by displacement, by direct pressure, or by traction on adhesions. Thus the embarrassment of the circulation, or pressure necrosis, or the tearing of tissues may be their essential etiologic contribution. A special source of danger is the tearing open by traction of an abscess wall, of which the adherent genitals may be a part. An inflamed appendix may transmit infection to the genitals. Therefore, puerperal sepsis may have its source in a complicating appendicitis, instead of through the usual external agencies at accouchment.

In six of the twenty-three cases occurring within ten days after labor, autopsy or operation demonstrated the appendix and some portion of the genitals to be bound together in a septic process. In two of these cases and in a third case the examinations were thorough enough to illustrate some of the different mechanisms by which puerperal factors may induce appendicitis. In one there was direct transmission of a septic infection along the appendiculo-ovarian ligament (so called ligament of Clado); in another the emptied uterus had torn adhesions loose causing perforation




of the appendix; and in another the omentum descending with the emptying of the uterus is supposed to have become kinked about the appendix. In only one of the group of twenty-three cases does the reporter suggest that there was no relation between the puerperal state and the etiology of appendicitis, and his reason is that appendicitis did not develop until the tenth day post partum.

The signs and symptoms of appendicitis occurring at this time are the same as at other times. The difficulty is to appreciate their true significance when they may be readily attributed to ordinary postpartum conditions. The pain of appendicular colic may be construed as "after pains" in the first forty-eight hours following labor. Tenderness over the lower abdomen is also common to the early postpartum and its true import can only be surmised when well localized. A slight rise of temperature and quickened pulse within thirty-six hours after labor may also be attributed to the absorption of ferments from the placental site. Moreover, when septic infection of the uterus or of the right adnexia is present, especially if it involves the peritoneum, the early diagnosis of appendicitis may be well nigh impossible. The precise localization of maximum tenderness at McBurney's point is more characteristic of appendicitis than of tubo-ovarian tenderness. Careful and repeated percussion of the lower abdomen is an important diagnostic method in assisting to localize the inflammatory process, unless uterine dullness occupies the field. The surest guide to an early diagnosis is extreme watchfulness on the part of the physician, and careful inquiry as to whether the patient has ever had symptoms of appendicitis. In eight out of the ten cases in

CASES DEVELOPING WITHIN THE FIRST TEN DAYS FOLLOWING PARTURITION

| No. | Date. | Age | Parity. | Append. Prim. or Recurrent. | Interval Between Labor and Append. | Complications of Labor. | Other Complications of the Puerperium. | Type of Append. | Treatment. | Termination. | Operation. Findings. | Autopsy Findings. | Reporter. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 1893. | .. | Multip. | Primary. | 7 days. | None. | None. | Supp. | Palliative. | Spont. rupture into bowel. Recovery. | ..... | ..... | Peterson, R. |
| 2. | 1893. | .. | ..... | Recur. | 2 days. | None. | None. | Perfor. | Palliative. | General peritonitis. Death. | ..... | Empty uterus had torn adhesions. Perfor. | Muret. |
| 3. | 1894. | .. | ..... | ..... | 10 days. | ..... | ..... | ..... | Operative. | Recovery. | ..... | ..... | Fowler, Geo. R. |
| 4. | 1895. | 40. | IX. | Recur. | 2 days. | Manual removal of placenta. | Peritonitis. | Supp. | Incision and drainage 6th day p. p. | Death. | Abscess cont. pus, feces, flatus. | ..... | Mundé, P. F. |
| 5. | 1896. | .. | II. | Recur. | 2 days. | ..... | ..... | ..... | Incision and drainage. | Recovery. | Abscess. | ..... | Noble. |
| 6. | 1897. | 26. | Multip. | Recur. | 5 days. | None. | Symptoms of peritonitis. | ..... | Palliative. | Recovery. Subsequent attack. | ..... | ..... | Abrahams, R. |
| 7. | 1898. | 20. | Primip. | ..... | 7 days. | ..... | ..... | Perfor. | Palliative. | Death. | ..... | Appendix perforated. | Iarca, Geo. N. |
| 8. | 1898. | 27. | II. | Primary. | 10 days. Recur. 4th week. | ..... | ..... | Supp. | Incision and drainage. | General peritonitis. Death. | Foul abscess. | Hypertrophic app. Adherent to rt. ovary. | Fraenkel, E. |
| 9. | 1898 | 22. | II. | Recur. | 4 days. | Forceps. | Peritoneal symptoms. | App. obliterans. | Appendectomy 6th week p. p. | Recovery. | Hypertrophy of appendix. | ..... | Vinay, Ch. |
| 10. | 1898. | .. | III. | ..... | 6 hours. | None. | ..... | ..... | Appendectomy after 6th day. | Recovery. | "Diseased appendix." | ..... | Marx, S. |
| 11. | 1898. | .. | ..... | Recur.? | 4 days. | None. | ..... | Supp. | Incision and drainage. | Recovery. | Small abscess. App. embedded. | ..... | Marx, S |
| 12. | 1902. | 19. | ..... | ..... | 3 days. | ..... | ..... | Supp. | Appendectomy. | Recovery. | Intraperitoneal abscess. | ..... | Rostovtseff, M. I. |
| 13. | 1903. | 32. | ..... | ..... | 2 days. | ..... | Foul lochia. | Perfor. | Vaginal hysterectomy. | Death. | ..... | Gangrenous appendix adher. to uterus. | Mauté, A. |
| 14. | 1903. | .. | Primip. | ..... | 2 days. | ..... | ..... | Perfor. | Palliative. | Death. | ..... | Gen. peritonitis. Perfor. appendix | Porak, C.; and Daniel, C. |
| 15. | 1903. | 30. | IV. | ..... | 4 days. | ..... | ..... | Supp. | Pall. & recovery. Oper. for recur. on 16th day p. p. | Death. | Gen. periton. Abscess rt. uterus. App. not reached. | ..... | LePage. |
| 16. | 1905. | .. | ..... | ..... | Shortly after deliv. Recur. 3 mo. | None. | ..... | Supp. | Appendectomy. Rt. oöphorectomy, hysterectomy | Recovery. | App. 5 in. long blue-black in tubo-ov. mass at rt. cornu. | ..... | Holmes, Rudolph. |
| 17. | 1905. | .. | II. | ..... | 4 days. | ..... | ..... | ..... | Palliative. | Recovery. | ..... | ..... | Meurer, R. J. Th. |
| 18. | 1905. | 23. | Primip. | ..... | 3 days. | Perineal laceration. | ..... | Supp. | Palliative. | Death. General peritonitis. | ..... | ..... | Meurer, R. J. Th. |
| 19. | 1905. | .. | ..... | ..... | ..... | ..... | ..... | ..... | Appendectomy. | Recovery. | Omentum kinked about app. during labor. | ..... | Keyes, Belcham A. |

CASES DEVELOPING TWENTY DAYS OR MORE AFTER PARTURITION

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20. | 1905. | .. | Primip. | ..... | 9 days. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Michel, G. |
| 21. | 1906. | 27. | III. | Recur. | 2 days. | ..... | ..... | Supp. | Drainage. Appendectomy. | Recovery. | ..... | Meyer, Max. W. |
| 22. | 1907. | 22. | Primip. | ..... | 3 days. | None. | Pneumonia. | Supp. | Incision and drainage. | Death. | Large ab. app. Pus, fecal odor. | ..... | Hilton, David C. |
| 23. | 1896. | 17. | Abort. | ..... | 2 days. | ..... | ..... | Supp. | Curetment. Laparotomy several days later. | Death. | Appendicitis suppurative. | ..... | Crutcher. |
| 24. | 1898. | 26. | Primip. | ..... | 45 days. | Forceps. Retained placenta. | Curetment 36th day. | ..... | Palliative. | Recovery. | ..... | ..... | Vinay. |
| 25. | 1898. | .. | ..... | ..... | 28 days. | ..... | ..... | ..... | Palliative. | Recovery. | ..... | ..... | Pinard, A. (Le Page's case) |
| 26. | 1898. | .. | ..... | ..... | 20 days. | ..... | ..... | Supp. | Incision and drainage. | Recovery. | ..... | ..... | Pinard, A. (Dieulafoy's case). |
| 27. | 1899. | .. | ..... | ..... | 27 days. | ..... | ..... | ..... | Appendectomy | Recovery. | App. adher. at apex. Fecal concretions. Adnexa healthy. | ..... | Fieux. |
| 28. | 1902. | 46. | ..... | Recur. | 3 weeks. | ..... | Retained placenta. | Supp. | Curettage and explorations 6 mos. later. | Patient left hospital with drainage. | Tumor mass, no connection with genitalia. | ..... | Rostovtseff, M. I. |
| 29. | 1902. | 30. | ..... | ..... | 8 weeks. | ..... | ..... | Perfor. | Palliative. | Death. | ..... | Perfor. of app. Gen. peritonitis. | Rostovtseff, M. I. |

which this item of the case history is recorded, the patients related symptoms of one or more previous attacks. The circumstances connected with childbirth, the ensuing pain and tenderness in the lower abdomen, and a prejudice to the belief that chills and fever at this time mean pelvic infection, tend to throw the physician off his guard; and likewise to confuse him when mindful of the possibility of appendicitis. Undoubtedly, many women, the cause of whose death is announced by that self-sufficient, blanket phrase "childbed fever," were the victims of postpartum appendicitis.

The prognosis of appendicitis occurring at this time seems grave. Of twenty-two cases developing within ten days following labor, ten died, a mortality of 45.5 per cent. Of the total twenty-three cases reported as developing within ten days following labor, sixteen or 70 per cent were of a suppurative or of a perforative type. Those who have had appendicitis before are more susceptable to an attack during the puerperium.

As to treatment, early surgical interference is the rational procedure offering a better outlook for these cases. The high mortality in operated cases was among those that had been allowed to pass on to suppuration or perforation.

## REPORT OF AUTHOR'S CASE

*History.* Mrs. H., age 22. Primipara. History of previous attacks not ascertained. Normal labor, December 25, 1906. On the third day postpartum she began to have chilliness and fever. The pain was undoubtedly mistaken for afterpains and overlooked. She continued a typhoid aspect for four weeks. The diagnosis was puerperal septicæmia. On about the sixth week an incision into the cul-de-sac per vaginam was made and some pus evacuated. Drainage per vaginam was instituted. About the eighth week the patient, who was steadily growing weaker with remittent fever, a leaky skin, and rapid pulse, developed capillary pneumonia.

*Examination.* I first saw her about the tenth week of her illness. Temperature 99½° to 102½°. Pulse thready, 128 to 168 per minute. Respirations, 30 to 42 per minute. Great prostration. Functions of kidneys and bowels regular. Somewhat dilirious. Capillary pneumonia with islands of consolidation in both lungs. Loud systolic murmur. Heart dilated to the left. Faint apex beat. Bimanual examination revealed nothing in the pelvis of pathologic significance. Percussion of the abdomen showed a well-defined area of dullness in the upper part of the right iliac and lower part of the right lumbar region. Extreme flatness at Mc-

Burney's point and extending two inches above. Below this point one inch the abdomen was everywhere tympanitic.

*Diagnosis.* Appendicitis with perforation. Appendiceal abscess. Capillary pneumonia. Cardiac insufficiency and endocarditis. Septicemia.

*Prognosis.* The family were told that the patient would die in her present condition, and that to open and drain the abscess could do no harm and might do some good.

*Treatment.* No general anesthetic was used. A three-inch incision, under local anesthetic, was made over the area of extreme flatness and the abscess opened. Nearly two quarts of offensive greenish yellow pus and watery fluid, containing flocculi, poured out. There was a strong faecal odor. The abscess cavity extended a finger's length upward and more downward from the incision. Drainage was inserted and the patient placed in bed, none the worse for the strain. Marked improvement, however, did not follow. The heart condition and lungs did not clear up. The skin continued leaking from general sepsis, and the week following the patient died near the end of a three months' illness.

This case diagnosed and treated as puerperal infection was a case of appendicitis incident to the puerperium, and overlooked because the initial symptoms and signs were masked by the symptomatic course of the puerperium.

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# DEPARTMENT OF TECHNIQUE

## A SIMPLE AND EFFECTIVE SELF-RETAINING ABDOMINAL RETRACTOR

By J. H. JACOBSON, M. D.
Attending Surgeon Lucas County Hospital, Member Surgical Staff St. Vincent's Hospital, Toledo, Ohio

The retractor as shown in the accompanying figures, is designed for median abdominal incisions.

It consists of an oval steel frame, whose vertical diameter is 24 cm. with a transverse diameter 15 cm.

The maximum amount of retraction obtainable in the transverse direction is 11 cm.

At each end of these diameters, retractors are, or may be attached.

For the sake of clearness of description and usage, those at the termination of the vertical diameters have been named the "Vertical Retractors," while those at each end of the transverse diameter have been named the "Transverse Retractors."

The retractors themselves consist of the ordinary concave retractor blades, 3 cm. by 4 cm. These blades are attached to a flattened shaft which is 10 cm. in length.

This shaft has a very coarse thread upon each edge, fitted to these threads is a large circular nut, with a roughened circumference. These large threads and the circular nut permit the rapid adjustment of the instrument when in use.

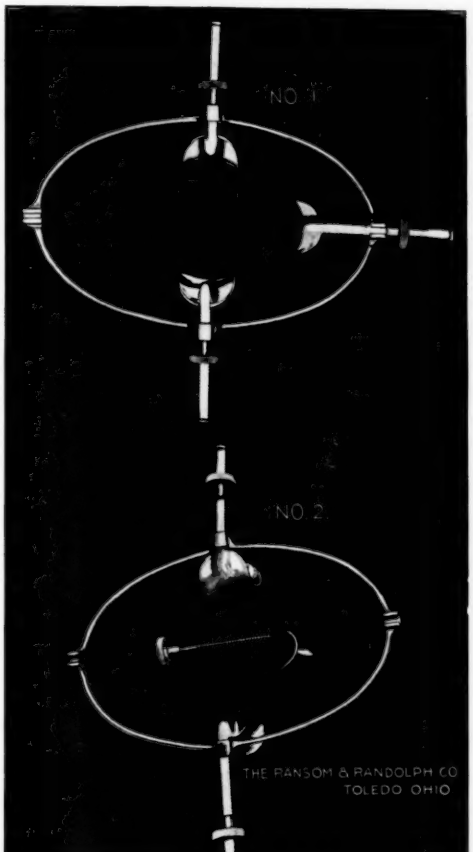
The transverse retractors slide in an oblong opening attached to the side of the steel frame, as shown in the figures, and they are not detached except for cleaning.

The Vertical Retractor can be adjusted or removed at the will of the operator. On the shaft of each vertical retractor, near its distal end, is a notch 1½ cm. in length, which permits of its adjustment to the oval frame, in an opening provided for it in the top of the oblong slide which is fixed at each end of the frame.

A small screw on the distal end of each retractor prevents the circular nut from coming off.

In using the instrument, it is best applied after the ligation and removal of all artery forceps, which may have been used in opening the peritoneal cavity.

The instrument is then placed on the abdomen with the blades of the transverse retractors in the incision, care being taken to have the edges of the blades in the peritoneal cavity.




The Vertical Retractor is not placed in its position until the required amount of retraction in the transverse direction is obtained. In median incision below the umbilicus the vertical retractor is toward the pubes, while in incisions above the umbilicus it is toward the ensiform cartilage.

The Retractors are best adjusted by pressing each blade toward the steel frame with one hand and the turning of the nut upon the shaft with the other hand.

The adjustment of the instrument need not take more than 30 seconds, after the placing of the instrument it needs no further attention and can be covered with towels.

It has been my custom to use only three retractors, although a fourth can be advantageously employed.

This instrument I have used during the past year and from its simplicity, good retraction, and ability to stay in position, I have found it to be eminently satisfactory. It is well adapted for all stomach and pelvic operations.

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# A SIMPLE METHOD OF INTESTINAL ANASTOMOSIS WITH A SINGLE LIGATURE AND TWO NEEDLES[1]

By H. M. HEPPERLEN, Beatrice, Nebraska

In the past few years it has been the aim of the more recent operators to use ligatures only in performing intestinal anastomosis, thus discarding buttons, bobbins and the various devices previously used to assist in the work.

Moynihan, in the preface of his latest work on Abdominal Operations, states that no mention will be made of mechanical appliances for intestinal anastomosis, as he thinks they have served their purpose and their interest now is only historical.

I have appeared in this Society before, on the subject of intestinal anastomosis, requiring a capsule made of gelatin, for a support, over which to stitch with a double suture threaded with a needle at each end. I have used this method for all of my work in this line for the past four years. For a simple and secure method, I believe none better where an appliance is used. Its only objection is that the capsules are not always at hand when needed, which, in a measure, caused me to use the stitch I am about to describe.

In January of the present year I was called out of the city to operate on a case of impaction of the bowel. After arriving at the place, I found, while unpacking my grip, that the nurse had forgotten my box of anastomosis capsules, which was always supposed to be included with the dressings and instruments for out-of-town operations.

At the time I gave it little thought, not thinking a resection would be needed, but upon opening the abdomen I found an impaction in a strictured portion of the small bowel, which required the resection of over eight inches.

I first thought of using the Connell suture, but found the only ligatures I had at hand were four intestinal needles threaded with No. 1 intestinal silk.

As I had been using a ligature with two needles for my intestinal anastomosis with the gelatin appliances, I at once conceived the idea of taking two of the threaded intestinal sutures, tie them together, and proceed to stitch the bowel. The method which I used in this case proved so satisfactory to me that I desire to recommend it to the profession.

I had my assistant hold the resected ends of the bowel together after the method of the first step in the Connell suture. I took my ligature of intestinal silk, which was double and about twenty-four inches long, with a needle on each end, and began stitching. (Fig. 1.)

I started my first suture about one-half inch from the mesentery attachment (Fig. 1), then continued by inserting both needles in opposite directions from the lumen, through all the coats of the bowel (Fig. 2), thus continuing the tying of each suture until I had gotten around the lumen of the bowel to within one-fourth of an inch of where the first stitch was taken. (Fig. 3.) The bowel was then inverted, and I completed the second step of the anastomosis by inserting my needles from the mucous coat through to the peritoneal coat, crossed them over and passed them through to the mucous coat, where the knot was tied in the lumen of the bowel. (Fig. 4.) The last three or four stitches I left untied, so as to leave room to manipulate the needles, which drew the bowel together snugly, with the last stitch and knot which came under the first stitch or place of starting. (Fig. 5.) All of the bowel was completely inverted with all the knots tied in the lumen of the bowel.

Should there be any trouble in placing the last three or four stitches, it would be just as well to close the small opening that remains by two or three

[1]Read before the Nebraska State Medical Assn., May 1–3, 1906.

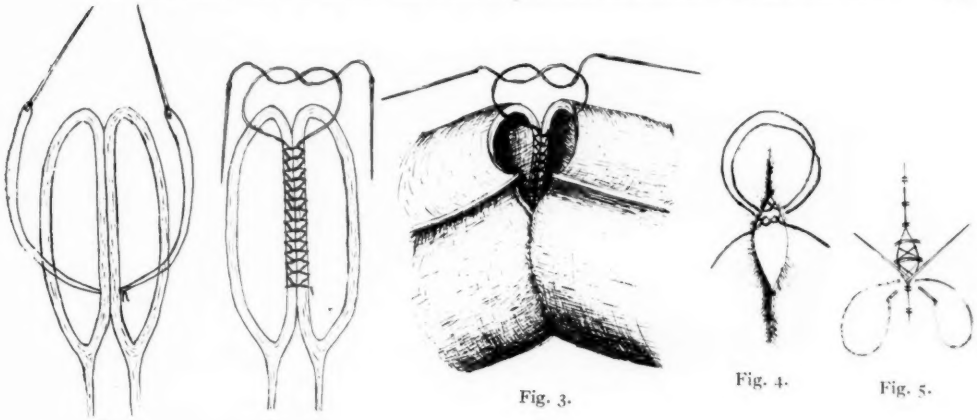

Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5.

Fig. 1. First Stitch. Fig. 2. Partly Stitched. Fig. 3. Same as Fig 2., continued. Fig. 4. Nearing Last Stitch. Bowel inverted. Knots inside. Fig. 5. Last Stitch. (Under the first with knot inside.)

Lembert sutures, which could be placed by passing each needle through opposite sides of the resected bowel and picking up a loop of peritoneal and muscular coats of the bowel and tying them on the outside. (Fig. 6.)

If desired, the Lembert suture may be continued around the field of anastomosis, as usually done in gastroenterostomy, with very little additional time.

The advantages I claim for the suture are:

1. It is so simple and easily understood that there is no part of the technique one can forget after once becoming acquainted with it.

2. If properly used there is no drawing of the bowel. The lumen remaining practically the same, and the double stitching making it so secure that the escape of gas or bowel contents is impossible.

3. The stitch can be used for gastroenterostomy and entero-anastomosis as well.

I used it in one gastroenterostomy, using the Moynihan clamps the same as where the single suture is used. Also in a case of lateral anastomosis in which the ileum was united to the ascending colon, in a case, where there was a large fecal fistula that would not close at the head of the colon, caused by a suppurative appendicitis. In both of these cases I began my suture at the lower angle of the resected portions I wished to unite, stitched the first half after the method above described in the first step in the intestinal anastomosis, when the clamps were released, and completed the anastomosis after the second step in closing the bowel.

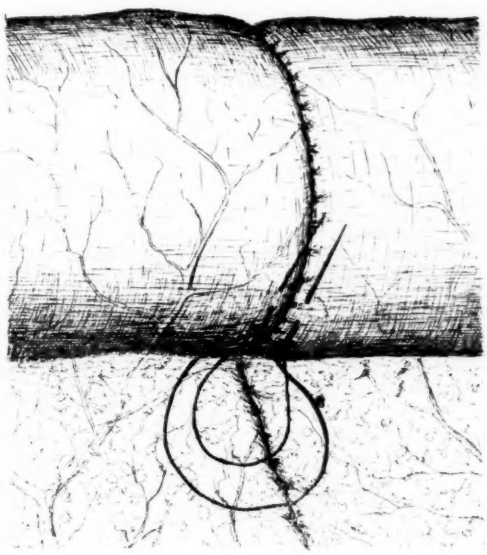

Fig. 6. Anastomosis complete. Needles inserted over last knot for Lembert Suture, if desired.

# EIGHT CASES OF SUPRAPUBIC PROSTATECTOMY; COMPLETE RELIEF OF SYMPTOMS AND PERFECT FUNCTIONING OF THE BLADDER

By DR. GEORGE WALKER
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AND
DR. WILLIAM A. FISHER
Assistant in Out-Patient Department, Johns Hopkins Hospital

CASE 1. Age 54. Family history is negative. One attack of specific urethritis at the age of 20, not associated with any sequelæ.

*Present Illness.* Two years ago the patient began to notice some difficulty in micturition; this gradually increased, the volume of the stream became smaller and the intervals between micturition shorter. Three months ago he became unable to void and had to resort to the catheter; none but a metal instrument could be introduced. Catheterization was necessary every 4 hours; there was no pain and the urine remained comparatively clear; the general health did not suffer.

*Examination.* Well-nourished, slightly anemic; heart and lungs are negative; arteries are soft; kidneys are not palpable; the prostate by rectal palpation is found to be somewhat enlarged; the outlines are regular; the surface is smooth; the consistency is slightly denser than normal; there is no tenderness and nothing can be expressed by massage; the vesicles are palpable, but show no induration. The soft rubber catheter and silk catheter meet with an obstruction in the prostatic urethra and will not pass. A silver catheter with a prostatic curve, No. 22 French, passes readily when the point is slightly deflected to the left in the prostatic region. Occasionally the introduction is more difficult and it requires some time to get the instrument beyond the prostatic obstruction. As it passes into the bladder one can feel a resistance that suggests a prostatic projection or bar; 150 c.c. of urine are usually withdrawn; the cystoscope cannot be introduced.

*Urinalysis.* Slightly turbid; pale straw color; acid, sp. gr. 10.20; no sugar; trace of albumin; a few pus-cells and epithelium; granular debris; no casts.

*Operation* (Dr. Finney, ether narcosis). A suprapubic incision was made in the usual manner; the finger was then passed into the bladder where a projection of the prostate just behind the urethral orifice could be felt; this mass was about the size of the end of the thumb and formed a valve-like bar over the orifice of the urethra. The vesicle mucous membrane was in good condition; a longitudinal slit about 2 cm. in length was made over this projection and the right index finger was introduced into it. The finger of an assistant was placed in the rectum and the gland pushed well up the plane of cleavage was immediately found and the whole gland was enucleated in one piece, except the tip of the projection which was broken off and removed by itself. A drawing of this specimen is shown in photograph No. 1. There was only a slight hemorrhage and no shock. A rubber drainage tube was placed in the bladder and two strips of iodoform-gauze were introduced above and below it. A small strip was packed into the cavity left by the excised prostate and one end of this gauze was pulled outside and made to project from the skin wound; it was identified by a black ligature tied around it.

Case 1. Prostate gland, photograph, actual size. Suprapubic section. The large mass consists of the right and left lobes, the smaller one of the middle projection.

Eight hours after the operation the patient began to suffer considerable local pain; this was relieved by removing the strip of gauze from the prostatic cavity; after this he had no further discomfort. On the following morning the bladder was irrigated through the suprapubic tube; there was some bloody oozing from the urethra, which continued for about 3 days. On the third day irrigation through the urethra was begun. These irrigations were continued twice daily for 5 days; then once a day for 3 days, and then discontinued. The patient did not complain of any local discomfort, except as above mentioned and the temperature never rose above 100° F. except immediately after the operation, when for about one hour it was 101° F. He began to pass water through the urethra on the ninth day and went home with the suprapubic wound entirely closed on the nineteenth day; since that time, now over 3 years ago, he has had no trouble whatever with the urinary function.

CASE 2. Age 63. Former history good; denied any venereal disease; applied to me for treatment November, 1901.

*Present Illness.* Twelve years ago he began to suffer with some difficulty in micturition; this gradually increased, and from time to time a catheter was used; there was little pain, but at intervals there was a feeling of uneasiness about the bladder region and the patient had to micturate every few minutes. These attacks would last for several weeks and then a more normal condition would be established. For the last year he has voided with great difficulty; it has required great straining and pressure on the abdomen to eject the water. Only a small quantity can be voided at a time and this passes in a dribbling stream.

*Examination.* Fairly robust, well-nourished man; heart and lungs are normal; kidneys are not palpable; pulse is 72, slightly irregular; arteries are soft. In the hypogastrium there is a large ovoidal fluctuating mass, which extends to the umbilicus; it is flat on percussion and is taken to be a distended bladder. The prostate by rectal examination is found to be decidedly enlarged, very irregular and nodular, and firm throughout. The left side is larger than the right; the finger cannot be passed above the gland; the vesicles cannot be felt.

A soft rubber catheter was easily introduced and 72 ounces of a pale straw-colored, slightly cloudy urine were withdrawn.

*Urinalysis.* Acid; pale straw color; slightly turbid; faint trace of albumin; no sugar; sp. gr. 10.18; pus-cells in moderate numbers; bladder epithelium; no casts.

He was sent to the hospital and regularly catheterized and irrigated for 4 weeks. The bladder gradually regained its power and became able to eject the urine after the catheter was introduced; at first it was necessary to express it by means of the hand on the abdomen.

At the end of this time a Bottini operation was done; one middle and two lateral cuts being made; this procedure was carried out without difficulty and no complications followed. After 2 weeks he began to void voluntarily; the amount at first varied from 30 to 50 c.c. This gradually increased so that in 3½ weeks from the time of operation the catheter was discarded, although the patient still had a residuum of a little over 100 c.c. When he was discharged he was voiding from 150 to 200 c.c. every 3 hours; this was effected without straining and the stream was of good volume and ejected with some force; his local discomfort had entirely passed away. About 1 year later he began again to have trouble with micturition, but I did not see him until 1½ years after the operation. At this time he could void a stream, but he had a residuum of about 300 c. c. Notwithstanding this, he refused to have anything else done. One year after this visit, 2½ years after the Bottini operation, he returned complaining of inability to void. A catheter was introduced and 500 c. c. of a very turbid purulent urine were withdrawn.

On rectal palpation the prostate presented about the same characteristics as at the former examination.

*Cystoscopic Examination.* The cystoscope was very easily introduced. There was a middle projection of the gland about a third the size of an egg; it was irregularly shaped and divided by a distinct furrow; it lay towards the left side; the bladder mucous membrane was inflamed, but otherwise normal; there was no evidence of trabeculation nor diverticula; the orifices of the ureters could not be seen.

*Urinalysis.* Acid, very cloudy; an abundant granular sediment after standing; very decided cloud on heating; sp. gr. 10.18, no sugar; a large number of pus-cells and epithelium; no casts; bacilli and staphylococci in abundance; amount in 24 hours 1600 c.c.

*Operation* (Dr. William A. Fisher, ether narcosis). A suprapubic incision was made in the usual manner. On opening the bladder there could be seen a large bifurcated middle projection which was slightly pedunculated. On either side were furrows, the result of a former Bottini operation. The mucous membrane over one of these projections was incised for a length of 2 to 3 cm. with a pair of scissors. The finger was introduced and the gland was enucleated against the finger of

Case 2. Prostate gland, photograph, actual size. Suprapubic section. *A*. Right lateral lobe. *B*. Left lateral lobe. *C*. Middle projection.

an assistant which was placed in the rectum. The middle projection and the right lateral lobe came out in one piece, the other lobe was enucleated afterwards, as shown in photograph No. 2. The shape of this gland was due to the former cauterization. The time for the complete removal occupied about 15 minutes. A piece of gauze was inserted into the prostatic cavity with the other end projecting from the abdominal wound; a large double rubber drainage tube with two strips of iodoform gauze were placed in the suprapubic opening, and the muscle and skin were approximated in the upper angle.

During the first 24 hours there was little urine secreted and the patient showed signs of uremia (drowsiness, hiccough and incoherent speech). Infusions of salt-solution were given every 6 hours under the breast (500 c.c. at a time). The flow of urine became well established after 36 hours and the symptoms passed away entirely. The bladder was regularly irrigated with a warm boric-acid solution. The tube was removed on the ninth day. Micturition commenced on the seventh day and the bladder wound was completely closed on the seventeenth day. At this time he voided without the slightest difficulty, pain, or discomfort, every 3 hours. He left the hospital on the twentieth day, with no residual urine and with the wound almost healed. Since then he has gained in weight; his general health has become excellent and an examination one year after the operation shows that he is voiding normally every 3 or 4 hours during the day; is disturbed at night only occasionally; has no residuum and the urine is entirely clear. He has had normal erections, the same as before the operation.

CASE 3. Age 74. Two attacks of specific urethritis in early manhood; no complication and no sequelæ followed. Fifteen years ago he began to have difficulty in passing water; later he was compelled to use a soft rubber catheter all the time. Twelve years ago, in order to relieve this trouble, both testes were removed at the Johns Hopkins Hospital. Several weeks after the operation the patient began to void and at the end of 3 months he discarded the use of the catheter, but the stream remained small and micturition was attended with difficulty. Two years ago urination became more difficult and for the past 6 months he has suffered with great distress in the bladder region, complaining more particularly of a feeling of pain and burning after each micturition. For one month he has been unable to void and is compelled to use the catheter every 4 hours; after which, some, but not complete, relief is experienced.

*Examination.* The patient is short and fat, with a large pendulous abdomen; the heart and lungs are negative; the kidneys are not palpable; the arteries are soft; the pulse is slightly irregular; the prostate is very small and feels as if it were atrophied; the right lobe is larger than the left, in places it is firm, but not hard; the vesicles cannot be palpated.

*Cystoscopic Examination.* A soft catheter was introduced very easily and 100 c.c. turbid urine were withdrawn. The bladder was washed thoroughly and 150 c.c. of sterile water were injected. This was retained without pain; the cystoscope was easily introduced and a small stone about the size of a hazel-nut was seen lying just behind the urethral orifice; it showed a dark mottling. The prostate projected well up into the bladder, forming a kind of collar; there was no discrete projection; the mucous membrane showed the changes associated with a chronic cystitis.

*Urinalysis.* Pale straw color; turbid; normal odor; acid, sp. gr. 10.20; trace of albumin; no sugar; large number of pus-cells; granular epithelium; no casts.

*Operation* (Dr. William A. Fisher, ether narcosis). The usual suprapubic incision was made; after the bladder was opened it was very hard to reach its floor on account of the great thickness of the abdomen. I inserted two fingers into the rectum and forced the gland upward as far as possible. The stone was readily found and removed; the gland projected into the bladder and formed a hard prominent collar around the urethral orifice. An incision, 2 cm. in length, in the middle line of the base of the bladder was made, beginning at the posterior border of the urethral orifice. A blunt dissector was introduced and the wall of the bladder was elevated; the finger then enucleated the left lobe in one piece, following this the right lobe was extracted. The enucleation was very difficult on account of the great depth caused by the thick abdominal wall and the unusual adhesion of the gland to its capsule. The specimen is shown in photograph No. 3. On section it showed adenomatous changes surrounded by thick fibrous tissue. The entire original gland tissue had practically atrophied.

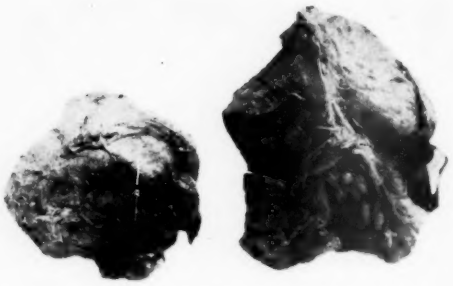
Case 3. Prostate gland, photograph, actual size. Suprapubic section. Right and left lobes.

A double drainage tube was placed in the bladder, with two strips of iodoform-gauze on either side; nothing was inserted into the prostatic cavity. The bladder was irrigated twice daily until all the bleeding had stopped (3 or 4 days). The iodoform-gauze was removed on the second day; the tube on the third day. After the removal of the tube the bladder was irrigated at intervals through the urethra. The patient made an uneventful recovery; suffered no local discomfort. The highest temperature was 100.6° F. Micturition began on the fifteenth day; on the seventeenth day there was no leakage from the suprapubic wound. The patient left the hospital on the twenty-second day, voiding a good full stream every 3 hours and was disturbed only twice at night. A letter received not long since states that his bladder function is normal.

CASE 4. Age 64. Has been a hard drinker; has had several attacks of specific urethritis; has had syphilis; nevertheless the general condition is excellent.

For 3 years he has had some difficulty in passing water; the stream has been small and lately it has required 15 or 20 minutes to accomplish the act. During the last few months the intervals have been shorter and he has been obliged to get up from 5 to 7 times at night.

*Examination.* The patient appears to be robust; the thoracic organs are normal; the kidneys are not palpable; the arteries are slightly hardened.



Case 4. Prostate gland, photograph, actual size. Suprapubic section. *A*. Right lobe, *a*. Middle projection. *B*. Left lobe.

By rectal palpation the prostate is found to be enlarged on the left side more than on the right. As a whole it is irregular and somewhat nodular; the consistence is firm, but not hard. The organ is tender in places; the vesicles can be palpated and feel normal.

Examination of the urethra showed that the wall about the middle portion of the canal was indurated for a distance of about 2 inches; at this place there was an extensive stricture. After the patient had micturated, a soft rubber catheter was inserted and 60 c.c. of urine were withdrawn. The cystoscope was introduced with some difficulty; no stone was found. There was a small projection about the size of the tip of the index finger just behind the urethral orifice. This was sufficiently large to cause obstruction. The bladder mucous membrane, except for a slight degree of inflammation, looked normal.

*Operation* (Dr. William A. Fisher, ether narcosis). The usual suprapubic section was made. The middle projection spoken of before was found. An incision was made over it and carried backward for a distance of 2½ cm.; the plane of cleavage was immediately found and the gland rapidly enucleated, being removed in 2 pieces. The specimen is shown in photograph No. 4. From the beginning of the abdominal incision to the complete removal of the gland the operation lasted 12 minutes. A drainage tube and gauze were introduced into the bladder and the upper angle of the wound (the skin and muscle) were brought together with 3 sutures. The tube was removed on the fourth day. Following the operation there was a mild degree of cystitis which retarded convalescence. The wound closed on the eighteenth day and the patient left the hospital on the twenty-second day, voiding all of his urine, although the act was attended with some pain. One month later the urine was almost entirely clear; the bladder held 300 c.c. There was no residuum — no pain and no discomfort. At present the frequency is normal. Erections are present since the operation.

Case 5. Age 68. Family history negative; one attack of specific urethritis at the age of 25, no complications or sequelæ.

*Present Illness.* Five years ago the patient began to notice that he had difficulty in micturition. This trouble gradually increased. The general health began to fail since about 2 years. One year ago he began to suffer from nausea; his appetite became poor and after each meal he experienced discomfort in the stomach region and some nausea; later this feeling of nausea was present most of the time; he gradually lost in weight and strength. Occasionally he had headaches, and at intervals attacks of dizziness. Insomnia became more or less marked.

*Examination.* The patient is feeble looking; very anemic; the color is ashy; the muscles are soft and flabby; he walks slowly. The heart and lungs are negative; the pulse is slightly accelerated, but is regular; the right kidney is not palpable; the left is large and firm; it is about the size of a grape-fruit; it is tender on pressure. In the hypogastric region there is a large ovoidal mass which extends to the umbilicus; it fluctuates and is flat on percussion; it is taken to be a distended bladder. The catheter is easily introduced and 1100 c.c. of slightly turbid urine are withdrawn; the prostate is irregular in outline; moderately enlarged and of firm consistency; the finger cannot be passed above it.

*Urinalysis.* Very turbid, pale straw color; feebly acid, sp. gr. 10.10; a few granular and hyaline casts; numerous pus-cells; albumin in large amount, much more than could be accounted for by the number of pus-cells.

On account of the general feebleness and the condition of the left kidney, the patient was sent home with a nurse and the bladder was catheterized every 6 hours and irrigated with a boric-acid solution twice daily. Five grains of urotropin 4 times a day were given. He soon began to improve; the urine became clearer and the kidney was reduced in size; 3 months after his first visit he returned for operation; at that time his general condition had greatly changed; he had gained 20 pounds in weight, was sleeping well and felt stronger; his appetite was good and there was no nausea nor headache; the urine was less purulent and I did not find any casts. On account of the condition of his kidney it was thought unwise to

use ether or chloroform, so nitrous-oxide gas was given.

*Operation.* Dr. William A. Fisher, nitrous-oxide gas, combined with oxygen was given for me by Dr. Rushmore; it proved entirely satisfactory. The patient was quiet, there was no cyanosis, nor any troublesome complication. He was kept under for 30 minutes; at the end of the operation he regained consciousness in a few moments, so that before he left the room he had entirely recovered. There were no after-effects, which in any way could be attributed to the anesthetic and he began to improve rapidly. I feel that the use of gas in this case was extremely important, for chloroform or ether would certainly have been dangerous.

After the suprapubic opening had been made in the usual manner, two projections in the floor of the bladder were found, each of which was about the size of the end of the middle finger. The urethral mucous membrane had been pulled up so that it partly covered them. An incision with scissors was made to the side of the projections; the plane of cleavage was found with some difficulty, but after the enucleation was begun it was very readily and quickly completed; the gland was removed in two pieces, as shown in photograph No. 5. There was no shock, the hemorrhage was a little more marked perhaps than when ether is employed for narcosis, but was not sufficient to have the slightest effect upon the pulse. There was some nausea for the first 24 hours; this, however, could not be attributed to the gas, for the patient had it at intervals before the operation. The bladder was irrigated once daily until the bleeding had ceased; the gauze was removed on the second and the tube on the third day; he began to pass water on the tenth day; the wound had entirely closed on the thirteenth and he was discharged on the fourteenth day. At that time he was passing his water every 3 hours, a good large forcible stream, with no discomfort whatsoever; there was no residuum.

I have examined him since the operation; he has continued to gain in weight, so that he now looks perfectly well and has perfect functioning of his bladder. The kidney can still be palpated, but has reduced definitely in size; the urine still contains some pus. Erections are more numerous and stronger than for some time before the operation.

CASE 6. Age 63. Family history negative. No history of urethritis; has never experienced any trouble with the genito-urinary organs until the beginning of the present illness.

*Present Illness.* For about 2 years the patient has noticed that the beginning of micturition has been delayed. Later, some increased frequency was present; there has been no serious inconvenience, however, until about one month ago when he had a sudden inability to void urine. Along with this, he had a very obstinate constipation which was of such a degree that intestinal obstruction was feared. He was catheterized by his physician who could not introduce a soft catheter but succeeded readily with a metal instrument. Catheterization was done every 3 or 4 hours during the night and day. The prostate, when examined by his physician, was found to be large and very tender. The urine was very purulent from the onset; the temperature was irregular and the patient had occasional slight chills. I saw him 3 weeks after the onset when the following condition was noted: Large well-nourished man, somewhat pale; chest and abdomen are negative; the kidneys are not palpable. By the rectum the prostate is found to be very much enlarged, being about the size of an egg, the surface is smooth, both lobes are symmetrical. It is soft throughout and slightly tender. External genitalia negative. A soft catheter was introduced and 200 c.c. of pale, very cloudy urine were withdrawn.

Case 5. Prostate gland, photograph, actual size. Suprapubic section. *A*. Right lobe, *a*. Middle projection. *B*. Left lobe.

*Urinalysis.* From 1800 to 2000 c.c. in 24 hours. Pale straw color, very turbid, normal odor, sp. gr. 10.12, acid, no sugar, decided trace of albumin after filtration. Microscopically, no casts, leucocytes in abundance, epithelium and bacilli.

The patient would not agree to an operation, so he was advised to have continued systematic catheterization and irrigation. After about one month he began to void a little urine, but the quantity remained small. His general health began to suffer and at times, particularly at night,

Case 6. Prostate gland, photograph, actual size. Suprapubic section. Both lobes in one piece, prostatic urethra in center.

he was irrational. His appetite became variable and occasionally he was nauseated after eating. Three months after my first visit I saw him again and used the cystoscope. The instrument was readily introduced, both lobes of the prostate extended well up on the sides of the vesical neck; below, there was a distinct sulcus, no middle lobe could be seen; the mucous membrane of the bladder showed the changes of a chronic inflammation; there was no calculus. The orifices of the ureters could not be seen.

*Operation.* Nitrous oxide gas, mixed with a small quantity of ether. Suprapubic prostatectomy by Dr. Fisher. The bladder was opened in the usual manner; the prostate stood prominently up in the floor; an incision was made into the mucosa and the gland was very quickly enucleated in one piece; the hemorrhage was slight. The patient did not take the gas well and showed symptoms of shock during and immediately after the operation. A rubber drainage tube and two strips of iodoform-gauze were placed in the bladder. The upper angle of the wound in the muscle was closed with three interrupted silk sutures, and the skin in the upper half brought together in the same manner. During the night following the operation the temperature rose to 104°F. and the pulse ranged from 140 to 160; on the next day the temperature dropped to normal and the pulse to 115 and 120. The general condition soon became excellent. The tube and gauze were removed on the second day. The bladder was irrigated through the urethra twice daily for 5 days; there were no complications; the patient was up in a chair on the third day; the wound soon began to granulate and rapidly closed down to a small sinus; this, however, remained open for nearly 5 weeks. He began to void urine in the fourth week and at the end of the fifth week all of the urine was passing through the urethra. Two months after the operation he had gained about 20 pounds in weight, was voiding a full, forcible stream without any difficulty and had no residual urine; the sexual function was still present.

The prostate was removed in one piece, carrying in its center the whole of the prostatic urethra; the gland was smooth, regular, both lobes were symmetrical, and the whole specimen was two thirds the size of an ordinary lemon. There was no middle lobe. The exact size is shown in photograph No. 6.

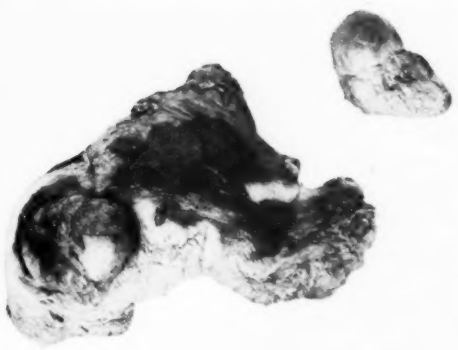
Case 7. Farmer, age 64; previous health excellent; specific urethritis in his youth. For several years he has noticed that the stream was small and has had some difficulty with the commencement of micturition. Three weeks ago he suddenly became unable to micturate at all and had to resort to a catheter. Before this could be done, over 1 litre had accumulated in the bladder, and from this time on he has been unable to void any urine.

*Examination.* He is slightly pale, but otherwise he has a healthy appearance; the lungs are negative; the heart is slightly enlarged and the action is irregular, but there are no murmurs. The abdomen is negative, the kidneys are not palpable; the external genitalia are normal. The prostate is moderately enlarged, the surface is nodular, both lobes are symmetrical, the consistency everywhere is soft; the vesicles cannot be felt; a soft catheter is easily introduced and 250 c.c. of a very cloudy urine are withdrawn.

*Urinalysis.* Pale, very cloudy, normal odor; sp. gr. 10.10; distinct trace of albumin after filtration; no sugar; abundant leucocytes; some epithelium; no casts.

*Cystoscopic Examination.* The bladder holds 200 c.c. with little discomfort; cocaine anesthesia. The instrument is introduced with some difficulty, the handle has to be lowered unusually, showing that there is a middle projection. In the middle of the internal urethral orifice there is a projection about the size of the end of the thumb. The lateral margins are smooth; the bladder shows a recent and acute cystitis. The orifices of the ureters are normal and eject clear urine. There are no stones.

On account of the acute cystitis the patient was kept in the hospital for one week and systematic catheterization and irrigations were used, together with large quantities of water and ordinary doses of urotropin internally.



Case 7. Prostate gland, photograph, actual size. Suprapubic section. *A*. Right and left lobes. *B*. Middle projection.

*Operation.* Ether, Dr. Fisher. Suprapubic prostatectomy. The bladder was opened in the usual manner; the gland was very easily enucleated in one large piece and a small one, the latter being about the size of the end of the thumb. There was only slight bleeding. The whole operation was completed in 25 minutes. On the second day the patient suddenly began to bleed from the bladder wound; the bleeding was readily stopped by introducing two straight retractors and packing the bladder with 3 strips of iodoform-gauze. Convalescence was rapid and uninterrupted. The vesical wound closed on the fourteenth day at which time the patient voided all his urine through the urethra. He left the hospital on the seventeenth day; was able to hold from 200 to 300 c.c. and was not obliged to micturate more than once every 3 or 4 hours. I have lately examined him and find his bladder function practically perfect. The urine is almost clear; there is no residual; he can hold from 300 to 500 c.c.; micturates every 4 or 5 hours during the day and does not have to get up at night; he has increased in weight and his general health is much improved. The specimen, as shown in photograph No. 7, consists of one large irregular piece, which comprises both lateral lobes and a small one, which projected into the bladder. It is soft throughout; there is no evidence of malignant growth.

CASE 8. Age 54; his previous health had been good; had never had any venereal disease; he had experienced no trouble with the bladder until September, 1906, when, after a sudden chilling, an acute cystitis developed. This continued unabated for nearly 2 months, during which time he was compelled to micturate every half hour. Occasionally at night he would have to get up 25 or 30 times; after about 9 weeks he improved considerably and remained better for 2 months, after the acute symptoms lighted up again, and continued without improvement until I saw him in February, 1907.

*Examination.* He voids urine every half hour; the stream is small, sometimes dribbling, and at the end of micturition the pain is very acute; occasionally the urine is bloody. From 100 to 120 c.c. are voided each time.

*Urinalysis.* Total quantity of urine passed in 24 hours, is 2400 c.c. It is acid, has a normal odor, sp. gr. 10.12. The filtered specimen shows a trace of albumin; no sugar. Microscopically, abundance of pus-cells, no casts.

The lungs, heart and abdomen are negative; the kidneys are not palpable; the abdomen is large and pendulous. There is a hydrocele on the left side, about the size of a large pear; except for this the external genitalia are normal; the prostate is very large, so that it is impossible to get above it; it is very tender, is soft, and in places almost suggests fluctuation. The surface is regular and smooth;

Case 8. Prostate gland, photograph, actual size. Suprapubic section. Both lateral lobes and middle projection in one piece.

both lobes are symmetrical. A soft catheter was readily introduced and 120 c.c. of urine were withdrawn.

A cystoscopic examination was attempted, but it was found impossible to pass beyond the prostatic urethra.

Owing to the acute inflammation of both bladder and prostate, a course of preparatory irrigation was instituted.

*Operation.* Ether, Dr. Fisher. Suprapubic prostatectomy. The abdomen was very large and the operation was thus rendered more difficult. The bladder was opened in the usual manner; a number of small soft stones were found, which were so fragile that they could not be removed whole. The gland formed a kind of collar around the urethral orifice and projected well up into the floor of the bladder. It was enucleated in one piece without removal of any of the mucosa of the urethra or bladder. The bleeding was moderate, not sufficient to show any evidence on the pulse. The suprapubic opening in the bladder was unusually long, being about 6½cm. in length. It was not closed at all. The usual rubber drain was not used; instead of it an extra piece of iodoform-gauze was employed, 3 strips in all being introduced. They were all removed after 12 hours and were not replaced. Convalescence was uninterrupted; the patient was up in a chair on the third day; he began to void on the thirteenth day and the wound in the bladder had entirely closed on the sixteenth day. He left the hospital on the twenty-first day, voiding all of the urine without difficulty and with no pain. I heard from him two months after the operation. He voids a full forcible stream every 3 to 4 hours without any discomfort and is much improved in health.

The specimen is shown in photograph No. 8; it weighs 4 ounces and 20 grains. It consists of two large lateral lobes, and one middle lobe; it is somewhat nodular, and is soft throughout; there are no bits of mucous membrane on its surface. The sexual function has not been disturbed.

The technic of the operation as practised by Dr. Fisher and myself is as follows:

The patient is put flat upon his back, the bladder is washed out and from 150 to 200 c.c. of sterile water are introduced into the bladder through a silver catheter, to the end of which is fitted a rubber tube. After the fluid has been injected, the rubber tube is clamped so as to prevent the outflow of the water and the instrument is left in place. This is done so as to serve as an aid in locating the bladder wall. An incision is then made in the suprapubic region, beginning at the pubic eminence in the middle line and extending upward for about 10 c.c.; the recti are found and separated with the finger; the edge of the pubis is then located and the prevesical fat and tissues are separated and pushed upward by the fingers covered with gauze. After this has been done thoroughly, the bladder is exposed and can be recognized by the tortuous veins passing from right to left across it. Two traction sutures are now placed in the bladder wall, one on either side of the median line and the bladder opened between them; the incision is enlarged above or below, as the case may require, with straight blunt scissors.

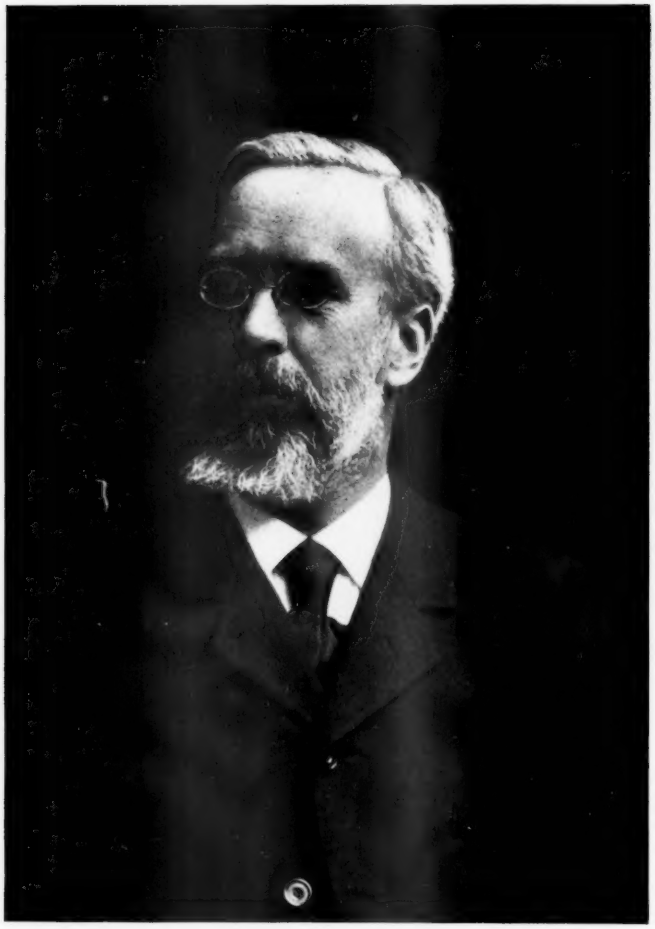
It is important to strike the middle line of the bladder, for two reasons: First, if one goes to the side, the incision is made into the muscle of the wall and occasionally the mucous membrane is separated for some distance before the cavity of the bladder is entered; and secondly, the subsequent introduction of the tube is rendered more difficult if the incision is to the side. The upper end of the wound, outside of the bladder, is packed with gauze so as to prevent the peritoneum from coming down into the field of operation. The finger of the operator is then introduced into the bladder and the finger of an assistant into the rectum. The operator might do both, but on account of contamination of his hand it is better to have the aid of an assistant. The bladder is then explored by the finger and the condition of the prostate made out. An incision is then made in the middle line, commencing at the border of the internal urethral orifice, and if possible slightly within it, for experiments made upon a number of prostates which I have removed on the cadaver have taught me that one can very readily make a right-angle tear unless the incision extends well up to or into the orifice. This cut is made either with a knife or scissors.

We have not found it possible to dig through with the finger nail as has been recommended by Freyer. After the incision is made a plain blunt dissector is used to raise the edge of the bladder wall and to find the plane of cleavage. The finger is then introduced and working over the assistant's finger in the rectum the enucleation, as a rule, is easily accomplished. One side may be taken out at a time or occasionally where there is a firm bridge between them, both may be removed in one piece. After this the bladder is irrigated with warm salt-solution through the urethra. The cavity left by the removal of the prostate takes care of itself; no tube nor gauze need be introduced into it. As a matter of fact, the introduction of the finger immediately after the removal of the gland will prove that there is left a much smaller cavity than one might have expected, inasmuch as the contraction of the tissue and the surrounding muscles reduce its

size very materially. The bleeding at the time of the operation is insignificant; in no instance has it given us any concern.[1] A rubber tube, half an inch in diameter, with several holes cut in it, and bent on itself so as to form a U with the arms close together, is introduced into the bladder and extends through the abdominal wound. It is not fastened by sutures. Two strips of iodoform-gauze are then placed alongside of it, one above and one below, one end being in the bladder and the other on the outside of the abdominal wound. The opening in the top of the bladder is not closed. The upper angle of the wound, skin and muscle, is approximated, more especially if the peritoneum protrudes. I believe, however, that a wide open wound is very essential. The remainder of the wound is filled with iodoform-gauze and a large gauze dressing is placed on the abdomen. The patient is put to bed and the wound is not disturbed, except to change the dressing from time to time.

[1] In our late cases we have not used any rubber drain, but simply 3 strips of iodoform-gauze. These are all removed on the second day and not reintroduced.

Lately, it has not been our custom to connect any drainage tube with the suprapubic tube, but to provide for drainage by means of frequent changes of the dressing. For the first three days irrigation, with warm boric-acid solution, is practiced once or twice daily through the suprapubic double tube. After this has been removed, the irrigation is continued, as long as it is thought necessary, through the urethra. I have not found it necessary to prolong this procedure after the bleeding has stopped, unless there is a foul bladder or an acute cystitis. The iodoform strips inserted into the bladder are removed on the second day and the tube on the third or fourth day; after this the dressing consists simply in changing the superficial iodoform-gauze. The patient is allowed to sit up in a chair on the third day, or even on the second day. Urotropin is given every 4 hours for the first week. The urine begins to pass through the urethra in from 9 to 12 days, and the wound is closed so that there is no leakage from the twelfth to the sixteenth day.



JOHN BERG, M. D.

# DEPARTMENT
# NICHOLAS SENN FESTSCHRIFT

## ON THE TREATMENT OF ECTOPIA VESICÆ

By JOHN BERG, M. D.,
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NOTWITHSTANDING the great amount of labor, which since the middle of the 19th century up to the present day has been bestowed by many eminent surgeons on the development of the operative treatment of this congenital malformation, no conformity exists as yet even as regards the main line of treatment to be followed in order to gain with the greatest degree of certainty the result aimed at. To verify the truth of this statement I need only remind of the views, directly opposed to each other, represented by two so eminent surgeons as Muscatello and Trendelenburg, and expressed as lately as 1905 and 1906.[1] The latter is just as firmly convinced of the ultimate victory of the direct-closing method as the former of the advantages of the method of transplantation of the ureters. Trendelenburg says in the latter part of the above mentioned article, "Cases of vesical ectopia are quite rare and their treatment demands much time and patience. It is only by the united labors of many investigators that substantial progress can be attained." Firmly convinced of the truth of these words, I venture in this paper to give a record of my personal experiences. They have previously been published only partly, viz: 1893, in "Nord. Med. Arkiv," in Swedish, and 1900, in "The British Medical Journal," being a paper at the General Meeting of the British Medical Association at Ipswich. I have since then gained some further experience and my views on the subject have in some respects changed.

On account of the kind and flattering request of the Editor, inviting me to contribute with an article of my pen to the international jubilee-number in honor of your great Nicholas Senn, I propose to give a short account of my work on this part of surgery and the conclusions I have been able to derive from it, refraining, however, from giving any introductory historical review of the subject, the literature being already so rich in these.

In the Autumn of 1886 I visited Professor Trendelenburg's clinic at Bonn. Amongst the many things I there saw with great interest, was one of the first cases of ectopia vesicæ, on which he had performed his famed synchondroseotomy. At home, the first case of this malformation which has come under

[1] *F. Trendelenburg:* The treatment of ectopia vesicæ. Annals of Surgery, August, 1906.
*Muscatello:* Zur Radikalbehandlung der Blasenektomie. v. Langenbecks Archiv, bd lxxvi, h. 4. 1905.

my care awaited me. During the 20 years that have passed since then, these cases have reached the number of 28, a figure which on account of the kindness of my colleagues to transfer their cases to me, most likely represents a large per cent of all the cases of extroversion of the bladder in my country during that period. The relatively rich material which has thus passed through my hands, has given me the opportunity of observing the great number of variations which this malformation, in common with all others, shows according to the varying degree of development, according to sex and age, and according to the nature of secondary changes present; these latter, perhaps, in most cases being the results of previous more or less unsuccessful attempts at treatment. This explains why, although at the beginning I tried to follow a certain line of treatment as the ideal one, before long I had to accustom myself to the necessity, in each special case, of reducing my demands in various ways and for many reasons, in order to confine myself to measures calculated to diminish in some way the inconvenience of the malformation in accordance with the individual character of the case. In this way I have been simply compelled to try all the different principal methods of treating an extroversion of the bladder, and I cannot understand the exclusive position taken by some of my colleagues towards this question.

Some examples may illustrate what I mean. Let us first take the case of a child, 2–3 years old, with an incomplete extroversion with none or only a slight separation of the pubic bones, small defect in the abdominal wall, good skin-edges, and without infection of the urinary tract. It is true, that even in such a light case as this no surgeon would hitherto have been able to promise to provide the little patient with a voluntarily-acting bladder, through a complete closing of the bladder and skin defect and simultaneous cure of the epispadias. But that such an operation is relatively easy, and may be performed without any risk, has been shown by others as well as by my own experience, and also that such a newly-formed bladder which is completely lined with mucous membrane, may through a slight outer pressure be made to perfectly keep the urine for 3 to 4 hours. Is it, then, good surgery to postpone the treatment of such a case until the child has reached at least 8–10 years of age, with the risk of the kidneys becoming in the meantime infected, and this with a view of removing the bladder at that time and implanting the ureters into the bowel? In spite of the improvements which this latter method of treatment lately has undergone, it can neither as regards technical difficulties nor as regards primary and secondary dangers, stand a comparison with the simple closing method. Nor may we forget, that even the most successful, voluntarily-acting cloaca is essentially inferior to the normal conditions.

We will take another case: Through the operations of Trendelenburg and myself, perhaps also through orthopædic treatment, when this is early begun (Passavant and others) it has been found possible under certain conditions to convert by means of a primary, not very dangerous operation, a case of complete extroversion with wide separation into a case of the same

type as that just mentioned. Would it, then, not be the right thing to do, to try to attain a fair result in a relatively safe manner by taking advantage of the tender age of the patient?

A third instance: Suppose a case, where we have tried the method just mentioned but where the result has been unsatisfactory. The edges of the defect have only partially been brought together. At the point where the strain was the greatest there now remains a round defect with cicatrized edges. The way which in such cases to my mind has seemed at the same time the least dangerous one to the patient, and still affording the chance of a relatively good palliative result, has been that of autoplasty, performed according to a method to which I shall later on come back.

The greater the difficulties that the case, either from the beginning or on account of unsuccessful therapeutic measures, offers for the formation of a new bladder in its normal position and with a "satisfactory" lining of its wall, the greater is the danger to which the patient is exposed, and the more justified are we at the present standpoint of our surgical technique to look for relief by means of the quick but dangerous method of implantation of the ureters. This latter line of treatment I now adopt without any hesitation in every case of extroversion in patients of mature age, with large abdominal defect and serious secondary changes of the protruding vesical mucous membrane which for years has been ill-treated. Experience has taught me that the closure of such a bladder, even after previous treatment with silver nitrate, very easily leads to an acute pyelonephritis.

It is for the present quite natural that the one surgeon should make greater use of one particular method than another, but already now to claim for one special method the advantage of being the one best fitted for all cases of ectopia vesicæ, especially when this is done on account of one or two "successfully" operated cases — this is a way of treating these cases which I must condemn as being stereotyped. In every way now known, and perhaps in some entirely new ones, we must try to improve our technique and to sharpen the indications for our line of treatment. This is, to my mind, the only practicable way of arriving at a satisfactory solution of the difficult problem which the treatment of this malformation has presented to the surgeon for three-quarters of a century.

After these general remarks I pass on to an account of my operative treatment of retroversion. As already stated, I made a beginning with Trendelenburg's operation as the one that most appealed to me. But there was one question which worried me with regard to his sacro-iliac division: "How does healing take place?" That it was possible after the division to approximate the two halves of the pelvic ring at the symphysis, I had seen, but naturally this could not take place without the formation of a wide, angular gap in the divided sacro-iliac synchondrosis which, however, with strong elastic power strove to close again. If this can be prevented by means of side pressure, an injurious effect upon the gait of the patient is risked, as either one or both halves of the

pelvis will be without any firm connection with the trunk. If, on the other hand, it cannot be counteracted, the whole operation will be of no use. By making the division, not in the broad articulation between the innominate bone and the sacrum, but in the pelvic ring more laterally, the prospect of obtaining a firm bony union in a corrected position seemed to me much brighter. The best place for such an osteotomy, I considered to be along a vertical line drawn from the highest point of the great sacro-sciatic notch upwards through the whole of the ileum, which at this point has its smallest height. The incision in the soft tissues divides here only the posterior portions of the great and middle gluteal muscles, without endangering any of the larger nerves and vessels, if only carefulness be observed at the lower end of the incision in the neighborhood of the notch, as otherwise the superior gluteal vessels may be injured at an inconvenient point. This is easily avoided by keeping aside the soft parts in the lower end of the incision by means of a hook-shaped, curved elevator, which is pushed along the outer side of the bone until its point reaches the notch. The handle of the instrument is now raised while the point is pressed against the upper border of the notch, along which it glides into the pelvic cavity, protecting the vessels during the chiselling. During this proceeding, care must be taken that the bone is divided at right angles to its surface, and that due consideration is taken of the greatly varying thickness and firmness of the bone at different points. A good way is to make, first, a groove in the bone by holding the osteotome firmly at sharp angles to the bone while the hammer drives it with light and even strokes from above downwards along the whole incision. Towards the lower end of the incision, the osteotome is raised in order to prevent it from gliding into the notch. A groove in the bone having in this way been marked out, it is made deeper partly by similar chiselling and partly, where the bone is thicker above and especially below, by means of powerful strokes in vertical direction. By means of the narrow Horsley probe it is easy to ascertain the depth of the groove. The bone ought not to be cut right through but the last portion snapped across by compression of the pelvis, the patient being in a side position with the pelvis firmly supported.

Pousson has in his well-known article in "Annales genito urinaires, 1888," only briefly mentioned this osteotomy of mine and dismissed it as being, according to his opinion, a proceeding which might after all prove too large and too dangerous. The figures he quotes from the statistics of my cases seem in some way to support this view. They are, however, taken from an incorrect abstract of a paper which I read at Copenhagen in 1887.

As a matter of fact, I have performed my osteotomy 14 times on 8 patients, the youngest 3 years and the oldest 26 years of age. Amongst these death has occurred twice so near after the osteotomy that one has to consider the possibility of a connection between the two. In the first case, where death occurred after three days, the result of the post-mortem examination seemed to me to point to a subacute chloroform poisoning as the most likely cause of death.

In the osteotomy-wound there were no traces of sepsis whatever. In the second case, death occurred after twelve days and was evidently caused by an acute pyelo-nephritis.

At the operation there had been some venous hemorrhage in the lower part of the osteotomy-wound. It had been arrested by pressure and a drainage tube had later on been inserted but without any further bleeding or oozing from the wound occurring. At the autopsy were found, besides the severe suppurative pyelo-nephritis, several large infarcts in the lungs and in the grayish red heart-muscle but no septic changes in the osteotomy-wound.

I may thus be justified in stating, that the osteotomy as such has not proved to incur any direct danger. The risk to which it exposes these often very delicate children, lies partly in the general anæsthesia and partly in an obstruction to the urinary outflow on account of the bladder having come to lie lower down after the approximation of the two halves of the pelvis to each other.

The former danger can be diminished through an improved technique entailing shorter time of operation. The latter danger, however, this operation shares with all other operative measures against ectopia vesicæ, at least those where the mucous membrane of the bladder is retained. This risk can be very much lessened through a previous energetic treatment of the bladder, eventually the ureters and the pelvis of the kidneys, with silver nitrate solution. In those cases where no decided improvement is obtained by this treatment, or where the surface is covered with papillomatous growths, it is advisable either to refrain altogether from operative interference, especially in cases where the kidneys are affected, or else to try the ureter-implantation method.

After the osteotomy has been done, much depends upon the drainage and the conscientious washing of the bladder.

A remark of considerable more importance may, however, be made against the value of osteotomy as a means of closing the vesical defect. As a matter of fact I have in several cases of osteotomy been obliged to repeat the operation either on one or on both sides, and still have in some cases been compelled ultimately to resort to autoplasty for closing the last remainder of the defect. But this uncertainty as regards the effect of the osteotomy does not apply to its influence upon the mobility of the pubic bones. In some cases, with a gap of 5 cm. at the symphysis pubis, the pelvic ring could be closed in front already after a one-sided osteotomy by the aid of a fairly-slight pressure, in other cases a double-sided division was necessary.

The fickleness of the ultimate outcome of the operation is due to the difficulty which is encountered in retaining the new form of the pelvis long enough for the complete union of the freshened and sewn edges of the bladder and the integument to take place. It must not be forgotten, that the whole series of operations represents a continued fight against hitherto untried difficulties, and that the value of the method as an element of cure is not justly to be estimated by the more or less imperfect results obtained during the period of

trial. Like Trendelenburg, I tried at first to maintain the corrected position by means of girdle-shaped pressure-bandages of various patterns. These were, however, apt to damage the skin in the trochanter regions and they always made it more difficult to keep the poor, little urine-smelling patients clean. The healing of the osteotomy-wound was also often delayed by secondary infection, especially as I, at first, made the mistake to plug or drain the wound. Month after month sometimes passed in this way before the closure of the defect was completed, and by that time a great part of the effect of the osteotomy was lost. The thought then occurred to me to try to avoid the outer bandage by inserting at the time of the osteotomy an ivory wedge in the lower, thicker part of the bony diastasis. The wedge was of about 1 cm.'s thickness at the base and had rough surfaces in order to prevent its sliding out. It was well retained in position, prevented the elastic traction of the bony parts, and was healed in without signs of local irritation in all cases of osteotomy where I used it. The wound was completely closed with wire sutures. After the operation the patient was kept in side-position, in order to insure effective drainage of the bladder and healing by first intention. I was thus enabled, after a double-sided osteotomy in two sittings with ten days' interval, to close the defect within three weeks of the first osteotomy. In one case of this kind, I detached in the same way as Trendelenburg has done, the soft tissues from the pubic bones, which had been approximated, sewed the buried edges of the infundibulum together, and lastly in front of this joined the symphyseal ends of the pubic bones by means of a couple of metal sutures. The epispadias was closed at the same time. Through the approximation of the crura of the penis to each other, this organ is made longer, and after the epispadias-operation becomes quite natural in shape and position. The primary result in this case was greatly admired by all those present, but the triumph was only of short duration. The wire sutures cut through the tender cartilagnous ends, then the external wound gave way at a point where the strain was strongest, and the infundibulum lay again exposed to view. Since then I have contented myself with approximating the ends of the pubic bones at the symphysis only so much that a direct sewing together of the newly-freshened skin-edges of the defect has been possible. But the margins of the bladder have in most cases been separately detached and joined with catgut. Another, not unfrequent cause of disappointment as regards the final outcome of these operations, is the thinness and cicatrized condition of the integument immediately surrounding the defect, this being highly detrimental to sound healing. This disadvantage may of course be avoided by excising the cicatrized parts, and transplanting on to the closed bladder a pedunculated thick flap from the neighborhood, a procedure which has successfully been followed in a few cases.

I have, however, as already mentioned, in not a few cases where direct closure has been unsuccessful and osteotomy seemed contra-indicated, had to resort to autoplasty. I may therefore be allowed to briefly describe the method which I always employ. The unfitness of both the single and double

skinflaps as substitutes for the bladder-wall I consider to be proved by a sufficiently large experience. Curiously enough this form of transplantation was part of the ordinary Thiersch's method for the treatment of extroversion, although I have been told that he himself had used, or at least recommended, the method of transplanting epidermis on to the under surface of a skinflap. It is, however, this latter method of autoplasty I have always used in these cases, without knowing that it had previously been practiced by Thiersch. According to my opinion, it possesses over the usual methods the advantage of giving, with the least expenditure of material, a bladder-wall which, having no hairs and being subject to the slightest possible loss of epidermis, does not dispose to cystitis or calculus. In this field for plastic operations as well as in others, for instance by defects of the bucca, of the frontal sinus, etc., I have had opportunity of ascertaining that the epidermis-covered surface keeps well, and when in constant contact with fluid gradually acquires the softness of a mucous membrane. In most cases of ectopia vesicæ where I have adopted this method of autoplasty, it has only been a question of replacing a small portion of the anterior bladder-wall. I go to work in this way: A flap somewhat larger than the defect, and with a pedunculated attachment below, is dissected free, is covered with epidermis and temporarily fastened in the groin by means of a few stitches, so that it comes to lie stretched with the grafted surface upwards. It is protected by a bandage. After eight to ten days the healing has advanced sufficiently to allow of the fixation of the flap in its proper place. It has in the meantime shrunk and become thicker, and thus forms very good material for the closure of the defect.

If we look at the final result of the treatment in those cases where a complete closure of the bladder has been attained with or without osteotomy, and with or without the aid of the above described autoplastic measure, it corresponds completely to that recorded by Trendelenburg several times. Any real continence of the newly-formed bladder I have not been able to attain, but a bladder which by upright position of the patient is able, with the aid of a lightly pressing pelotte, to hold the urine 2 to 5 hours and which allows the urine to pass in a good stream as soon as the pressure is taken off. Only in one case have I, sometime after healing had taken place, been compelled to relieve the patient of incrustations of the anterior wall, but this was evidently caused by my neglecting to join the margins of the mucous membrane separately, when I closed the bladder. As soon as the inner side of the wound at the line of union had healed completely, the formation of new stones ceased. I have seen two of these patients again after respectively 10 and 14 years. They had developed into healthy young men and were able to earn their living by their own work.

Apart from the fact that the direct-closing method must be regarded as the most ideal one, and the one least dangerous to life in suitable cases, I should like to point out once more that this method assigns the most suitable time for treatment to the early period of childhood, whereas the ureter-implantation,

according to the present view, must be postponed to a later period,— according to Maydl, Muscatello and others, as late as after the 10th year. Every delay in the treatment of this deformity entails, however, the risk of a secondary infection of the urinary tracts and makes the prognosis for any form of treatment less favorable. Besides, the early childhood makes it easier for the patient to bear the discomforts of the treatment and the prolonged stay at the hospital.

And now we have come to what I consider the weakest point of the "ideal treatment," [1] viz: its long duration. Still, the most wearisome part of the treatment is often that of the remaining fistulæ.

As, however, the operation of implantation of the ureters, under the influence of the great technical improvements of Maydl, has shown a decided decrease of mortality, I thought that also I had the right to adopt this shorter course. I did it for the first time in the case of a girl of four years, on whom I had performed a double-sided osteotomy towards the end of 1903, followed shortly after by the closure of the whole defect, also of the urethra, in one seance. Under the influence of an erysipelas, nearly the whole wound, however, gave way. Early in 1904, an operation according to Maydl was performed. The shortness of the sigmoid flexure did not allow of the Berglund-Borelius' modification. The operation was successful and healing took place, but after a week and a half signs of pyelonephritis became more and more manifest and the little patient died after 22 days. The post-mortem examination showed good healing and suppurative pyelonephritis. The same year I operated for the second time according to Maydl. It was a man of 34 years with a 6 cm. wide separation and with a hernia-like protrusion of the bladder-wall, the surface being covered with papillomatous growths. He was so tired of life that he willingly submitted to every risk to have a chance of getting rid of his suffering. In this case also the flexure was so short that only the original operation of Maydl seemed practicable. Healing took place. In January 1907, I visited him at his small country cottage and found him in excellent health and able to work, very well pleased with life, and with a fine wife at his side. He was able to hold the urine 7 to 8 hours during the day and 3 to 4 hours during the night. A large hernia had formed between the lower parts of the widely diverging borders of the Recti muscles, but a home-made bandage enabled him to carry on his work as a carpenter. Both these operations gave me a strong impression of hazard. The long duration of the operation, the extirpation of the infected bladder in immediate proximity to the opened peritoneum, the fastening of the resected piece of the bladder-wall with alteration of the direction of the ureters, the intra-abdominal opening of a piece of bowel which very soon will be filled with fæces, and lastly the returning of this portion of the gut to the abdominal cavity, which is immediately closed — all this, one is bound to confess, endangers life rather too much, considering that the

[1] This name may on account of its shortness be excused. It is, at any rate, as much justified as to call implantation of the ureters the "radical treatment" of ectopia vesicæ.

operation is undertaken for the relief of an evil which in most cases does not directly threaten life. On the other hand, it was clear to me that if the danger attending the bowel implantation of the ureters could be reduced, this would be of great value, not only for the treatment of some forms of ectopia vesicæ but also for the operative treatment of several other diseases of the bladder, which necessitate the removal of the bladder either wholly or at least in its posterior part, such as cancer of the bladder, diffuse recidivating papillomatous growths, especially when infected, and perhaps also certain forms of tuberculous disease of the bladder. The altered plan of operation which I adopted in the summer of 1905 for my next case of extroversion, I have myself followed in five cases, and a sixth one has kindly been reported to me by the operator, my friend and former assistant, Dr. E. Salén. The idea of making use of a loop of small intestine in the treatment of ectopia vesicæ has, as is well known, first been realized simultaneously by Rutkowski and Mikulicz in 1898. They used the piece of the intestine for the perfection of the bladder. I use it for another purpose.

In order to avoid unnecessary words and reiterations, I at once pass on to the description of my method, at the same time indicating a few practical measures, the usefulness of which have been proved by experience. The operation is performed in two or three sittings. In the case of full-grown patients it has been done under lumbar anæsthesia.

First Stage. The wall of the bladder is covered with a piece of sterile water-proof cloth, which by means of a few stitches is fastened along the left margin of the defect. The patient is placed with raised pelvis in slight side-position towards the right, so that the urine can freely escape along a strip of gauze leading from the bladder, underneath the cloth. The abdomen is opened by a small incision either along the outer edge of the lower part of the left rectal muscle or just above and parallel to Poupart's ligament. The sigmoid flexure is looked for, its mobility in different parts is examined, and the mobile loop lying most distally is fixed by means of an intestinal clamp. Next, an adjacent loop of small intestine is selected, the mesentery of which easily admits of the piece of bowel being, on the one hand, fixed to the selected part of the flexure, on the other hand, to the anterior abdominal wall in close proximity to the place of the bladder defect. From this coil of small intestine a piece, varying from 10 to 25 cm. in length according to the age of the patient, is isolated from its connection with the rest of the intestinal canal by means of resection. It is important that not too small a piece is taken. In order to increase the mobility of the resected portion, the mesentery is also divided as far down as can be done without interfering with the vascular supply of the gut. The continuity of the intestinal canal is then restored by end-to-end suture of the divided segments, whereby care must be taken that the isolated piece of intestine comes to lie in proper relation to the site of union of the intestines. Should a suitable piece of omentum be at hand to cover the line of suture, this ought to be done in order to prevent adhesions. Next, the ends

of the excised piece of bowel are closed separately. The free edges of the mesentery are carefully lined with serous coat in order to prevent the formation of adhesions. The distal end of the resected piece of small intestine, and the clamped portion of the sigmoid flexure, are drawn outside the abdominal wound and a small lateral anastomosis is made between these two intestinal portions. When doing this, care must be taken in placing the loop of small intestine so that its contractions come to go in a direction towards the sigmoid flexure, not vice versa. The careful stitching of the edges of the mucous membrane separately when making the anastomosis is probably to be recommended in order to obviate a secondary narrowing of the opening. If the bowel at this stage is returned to the abdominal cavity without further measures, the next step is made more difficult on account of the folding of the resected loop of ileum, and the formation of adhesions between it and surrounding structures. The free proximal end of this loop is therefore fixed by means of a couple of sutures to the peritoneal lining of the anterior abdominal wall, in immediate proximity to the left edge of the defect. A still better way is to let an assistant, with a finger in the bladder, press the serous covering of the bladder itself towards the operator, and to fasten the intestine to this. This concludes the first stage of the operation. The abdominal wall is closed and covered with collodium.

SECOND STAGE. Two or three weeks later, the interval varying with the condition of the patient, the second operation is undertaken. This is begun with an extraperitoneal removal of the bladder, with the exception of the elliptical piece which surrounds the orifices of the two ureters. The dissecting is easiest done in the subserous connective tissue. With the aid of a fine sound in each ureter these may also be laid free within the retroperitoneal tissue through blunt dissection, and while being kept stretched by means of a compressorium forceps. When the lower margin of the elliptical piece is freed, one has to avoid cutting into the crura of the penis, the prostate, the vesiculæ seminales, and the vasa deferentia. The hemorrhage is during this part of the operation sometimes rather troublesome. As soon as the trigone of the bladder, including the lower ends of the ureters, has been sufficiently separated, the rest of the bladder-wall extirpated, all bleeding stopped, and the parts thoroughly dried, the exposed peritoneum is divided in the middle line and this incision eventually prolonged upwards through the abdominal parietes above the defect. The intestinal loop which has been joined to the sigmoid flexure is now freed from its connection with the anterior abdominal wall, as well as from such adhesions that may eventually prevent its being drawn sufficiently forward. The peritoneal cavity having been carefully shut off by means of compresses, the trigone is transferred to the loop of small intestine, where it is fastened by sewing to the margins of a longitudinal slit in the free border of the bowel. When the implantation has been completed, the bowel is returned to the abdominal cavity, the incision in the abdominal wall above the defect is closed in the usual manner, and the two flaps of the vesical peritoneum

joined above. Below, at the site of implantation, the parts are left uncovered by peritoneum, this being by means of fine sutures fastened to the serous wall of the intestine all around the implanted trigone. There being always more peritoneum than is needed, it is possible also to invest the lower end of the ureters with peritoneum after this has been suitably incised. When the abdomen has been in this way carefully closed, the open wound is lightly packed with gauze.

At the end of a period of time long enough to make the success of the implantation certain, provided the size of the defect requires such a measure, I proceed to the

THIRD STAGE. At this a thick, pedunculated flap of suitable size is taken from the neighborhood and transplanted on to the granulating surface of the wound.

The advantages to be attained by this modification of Maydl's operation may briefly be summarized as follows:

1. By dividing the operation into two parts, a double advantage is gained, viz: shorter time of anæsthesia, and complete union of the entero-anastomosis before the urine is allowed to pass into the intestine:

2. The direct danger of infection is reduced through the restriction of the manipulation of the large intestine to the application of a small lateral anastomosis:

3. The introduction of a coil of small intestine as a link between the ureters and the large intestine, makes us independent of the varying mobility of the sigmoid flexure in different individuals, and is, on the other hand, likely to diminish the risk of an infection along the ureters:

4. The extirpation of the bladder and the separation of the trigone including the ends of the ureters, is done outside the peritoneal cavity:

5. By placing the site of implantation outside the peritoneum in the anterior abdominal wall, the risk of getting an urinary fistula is decreased; and

6. On account of a simplified technique the operation may be performed also during early infancy.

In order to give an opportunity for judging how far these advantages in reality have been attained, I shall now briefly give the details of my cases.

CASE 1. A boy, 17 months old. Complete ectopia vesicæ. A protrusion of the bladder-wall of the size of a fist. Broad separation at the symphysis. A large inguinal hernia on the left side. The child was weak and fidgety, and had often been suffering from diarrhœa. I advised against operation but at last yielded to the entreaties of the tortured parents. Laparotomy on May 19, 1905, under slight ether-anæsthesia. The incision was made immediately above Poupart's ligament, reaching to the outer edge of the left rectus muscle. A coil of the ileum provided with a Meckel's diverticulum presented itself.

The coil was isolated in the manner described. An anastomosis was made between the diverticulum and the sigmoid flexure. The proximal end of the resected part was fixed to the anterior abdominal wall The child being very much pulled-down by the operation, died after 24 hours, with a temperature of 40.1°C, suppression of urine and signs of pneumonia. The post-mortem examination showed: abdomen free, hydronephrosis of both kidneys, cor bovinum, beginning pneumonia. Death probably due to the anæsthetic.

*The remarks.* The case ought of course, not to have been operated: on the other hand it convinced me of the technical possibility of doing the implantation also in the case of infants.

CASE 2. A boy, aged 4 years, who was admitted into the Hospital on December 12, 1905, had been operated by Dr. Michaelson in Vestervik during the summer for total extroversion with a separation of 5 cm. The edges of the defect had been loosened and joined along their whole length and the epispadias had been closed at the same sitting. With the exception of the pars glandularis penis the whole line of union had separated. The case was kindly sent to me by Dr. M. During his first year and at a few subsequent occasions the boy had suffered from an obstinate diarrhœa, but had since then improved. He was now thin but without definite signs of disease. The urine obtained from the ureters was clear and free from albumen. The edges of the defect much cicatrized. Double-sided inguinal hernia.

*First operation*, on Dec. 9, 1905. An oblique incision above Poupart's ligament. A piece of intestine 6 to 8 cm. long was resected and fixed by its proximal end, near the middle line. The operation was well borne. The boy showed, however, during the succeeding weeks, an inclination to diarrhœa, on account of which the next stage was somewhat postponed.

*Second operation.* Performed on January 8, 1906. A curved incision along the upper and left edge of the defect by which the peritoneum was opened. A clamp was applied to each ureter from the inside of the abdominal cavity. The bladder-wall was then dissected free outside the peritoneum until it was held only by the two ureters. The elliptical piece of trigone retained nearest the orifices of the ureters was only of about 1 cm. width. The resected piece of intestine was looked for, and some adhesions having been separated it was drawn forward. Some tension arose when the trigone was sewn into the bowel, this being due to the small size of the piece of bladder-wall left. The vesical peritoneum and the site of implantation was treated in the manner previously described. The integumental edges were joined at the upper part, below a defect of about the size of a dollar-piece remained; this was plugged. The patient stood the operation well. At the end of 24 hours the urine commenced to pass off per rectum, to begin with involuntarily at night, probably on account of a simultaneous diarrhœa. During the first few days a small quantity of urine dribbled away at the site of implantation, but after January 24th, this fistula seems to have healed. On February 2nd the boy passed water seven times during the day and could as a rule also let his wants be known during the night.

*Third operation.* The defect was closed by means of a pedunculated skinflap.

*Fourth operation*, on February 26th. Radical cure of hernia was performed on both sides. On March 21st the patient was sent away with the wounds soundly healed and greatly improved in his general health. According to a notice from Dr. M. who, however, had not himself seen the boy, the latter died in September last year. He considered the cause of death most likely to be a pyelonephritis.

*The remarks.* The case taught me that the loop of intestine which in this case had been resected was too short. Another mistake was made by leaving too small a portion of the bladder-wall round the ureters. I fear lest one of the outermost silk sutures may have passed through the wall of one of the ureters. Through this a leakage of short duration ensued, but thanks to the extraperitoneal treatment no peritonitis followed. The fistula closed, but no doubt a cicatrice formed in the immediate vicinity of the end of one of the ureters. Whether the pyelonephritis, which later on evidently developed, was caused by infection from the intestine, to which the boy might have been more liable through his disposition for diarrhœa, or from the site of the fistula, where a gradually increasing stricture on account of the continued suppuration

round the stitch might have formed — this is a question which unfortunately cannot be decided, no autopsy having been made.

CASE 3. A boy, aged 6 years, admitted on March 1, 1906, with complete extroversion, the surface of the protruding bladder-wall covered with mucus, and with a separation of about 4 cm. at the symphysis. The urine clear and free from albumen. A systolic murmur at the base of the heart. Other organs showing nothing abnormal. Nutrition fairly good.

*First operation*, on March 5th. An oblique incision above the left Poupart's ligament. A loop of small intestine about 15 cm. long was resected. The distal end was by means of a lateral anastomosis of 6 cm.'s width joined to the colon. The proximal end was fixed to the abdominal wall. Good healing was secured.

*Second operation*, on March 23rd. Extraperitoneal separation of the bladder from above downwards, the ureters being caught outside the peritoneum. At the lower part of the wound a troublesome hemorrhage occurred, rendering the dissection more difficult. When the elliptical piece of the bladder-wall, including the ureters, was completely separated, the vesical peritoneum was incised horizontally. However, as this was found not to give sufficient room for the selection of a loop of intestine, the opening was enlarged by cutting through the internal portion of the left rectus muscle. The intestine had been fixed rather too far towards the left. The implantation was made more difficult through my mistake to suture the mucous membrane first. Two rows of catgut and a third outer one of the finest silkworm-gut were applied. The transverse incision in the peritoneum was closed at both ends, in the middle each margin was sewn to the intestine close above and below the site of implantation, so that this came to lie outside the peritoneal cavity. The transverse cut in the rectus was closed by double stitching muscle-and skin-sutures and the remaining defect packed with gauze.

On April 2nd the healing was uninterrupted but fever had been present since a few days back. Free escape of pus from the left part of the wound. A tender swelling in the left groin. On being incised a suppurative orchitis of the left undescended testis was found. This was extirpated and the wound plugged, after which the temperature went down and the discharge very soon ceased. On April 28th the wound in the groin had healed. The upper part of the defect was covered with epidermis. Below, above the root of the penis, suppuration still going on. Here a silk suture was found. On June 21st, the boy was dismissed cured and with good general health. He was able to hold the urine from four to five hours during the day and passed water spontaneously once during the night. When I last heard of him in December 1906, he was well.

*The remarks.* In this case the intestine had been fixed too far from the left edge of the defect. The infection of the left stone was probably due to the unintentional catching and ligation of the vas deferens during the process of separation of the lower part of the bladder and its subsequent infection from the wound.

CASE 4. A man, aged 42 years, farmer, admitted on November 11, 1906. Complete ectopia. The extroverted bladder wall forming a swelling the size of a large fist, which only by the aid of pressure could be forced back into the abdominal cavity when the patient was in recumbent posture. The separation at the symphysis 5 to 6 cm. wide. He had been using a home-made urinal of sheet iron. He now sought relief for a right-sided inguinal hernia which lately had caused him great inconvenience. He was thin, with badly developed muscles but otherwise without objective signs of disease. The urine obtained separately from each ureter was free from pathological organized elements but contained distinct traces of albumen. He willingly consented to an operation for the cure of the deformity, although the dangers attending the same were in no way concealed from him. As a preparatory step, he was kept on his back for some time while his bladder was treated with silver nitrate.

*First operation.* On November 28, 1906. Lumbar anæsthesia with novocain. About 20 cm. of the small intestine was resected and fixed to the anterior abdominal wall, in this as in the previous case somewhat too far away from the peritoneum of the bladder.

*Second operation.* On December 19, 1906. On account of the inconvenient position of the fixed bowel, this was somewhat injured on being detached, but without this causing any trouble. Rather severe bleeding at the time of extirpation of the lower portion of the bladder, otherwise the method employed not differing from that used in the previous cases. Good healing. No urine was passed until after the lapse of 24 hours. During the week following, it was led off by means of a permanent rectal tube. After the removal of the tube the power of continence rapidly increased to three to four hours.

*Third operation.* The defect was covered with a pedunculated flap from the scrotum which healed by first intention. He left the Hospital the first of February, 1907, very satisfied.

Lastly, a short account of a case of cancer of the bladder will be given, the same method of treatment being here adopted.

CASE 5. A woman, 63 years old. Cancer vesicæ urinariæ. Admitted on May 5, 1906. Symptoms present during the last three-fourths of a year. Now emaciated with repeated tenesms, incessant severe pains, turbid, blood-colored urine, the examination of which did not give any definite information as regards the condition of the kidneys. Catheterization of the ureters unsuccessful. Palpation and inspection by the cystoscope revealed the presence of a solid tumor, infiltrating the left half of the anterior wall of the bladder, and below implicating the base of the organ and posterior wall. Urethra free. In front involvement of the pelvic bones at the lower margin of the horizontal ramus of the os pubis was feared. Anterior fornix of the vagina possibly somewhat less mobile than normally. Uterus free. The patient insisted on being relieved of her sufferings, if possible.

*First operation,* on May 11th. A curved incision at the outer edge of the left rectus muscle, below turning outwards parallel to Poupart's ligament. Resection of a piece of bowel and entero-anastomosis, as in previous cases, but without fixation of the proximal end to the anterior abdominal wall. By intra-abdominal palpation, it was found that the lower part of the bladder was adherent, though not firmly, to the lower position of the symphysis pubis. No enlarged glands. After the operation the patient suffered from diarrhœa during a few days. This, however, was checked by the use of opium by the mouth and irrigations of the bowel with silver nitrate solution. The general condition unchanged.

*Second operation,* on May 29th. Lumbar anæsthesia with 4 c.c. of a five per cent solution of novocain. Towards the end of the long operation 5 c.c. chloroform were given. The whole bladder was extirpated, part of its peritoneal covering having to be removed posteriously. The seat of entrance of the ureters being also affected these had to be divided outside the bladder; below, the anterior fornix was opened; anteriorly the growth reached the bone at the posterior aspect of the left pubic bone. The cutting of the vena pudenda caused here a rather severe bleeding, which, however, was stopped by means of ligation *en masse.* The extirpation having been completed, some difficulty arose in drawing forward the loop of intestine, which, on account of my neglecting to fasten its proximal end to the abdominal wall, had got folded and largely adherent to surrounding structures. It was freed and pulled outside the peritoneal cavity, and the ends of the two ureters implanted separately but without invagination according to Witzel's method, the piece of intestine being too small. Only catgut was used for the sewing. The peritoneum of the bladder which had been left sufficed to close the abdominal cavity in the usual manner. The channel-shaped extra-peritoneal cavity behind the symphysis was drained at its lower end through the opening in the anterior fornix, while its upper part was packed with gauze. The patient stood the operation badly and never rallied. After a few days the urine, which now partly escaped through the wound, gradually became more and more bad-smelling and mixed with fæces. The walls of the cavity became gangrenous. Death on June 12th.

The post-mortem examination showed the peritoneal cavity free from infection. The intestinal wound at the seat of implantation of the ureters had opened towards the praeperitoneal cavity; double-sided hydronephrosis and chronic nephritis; hypertrophia cordis levis; no fresh infection of the pelves of the kidneys.

*The remarks.* The extension of the cancer forwards made a radical cure impossible. If a sufficient long and free coil of intestine had been at my disposal, the implantation of the ureters might have been done in a more reliable way, thus affording a fair prospect of relieving the patient for some time at least, of her sufferings, provided healing had taken place. The chronic disease of the kidneys, which unfortunately could not be diagnosed beforehand, made in this case the prognosis less favorable. Much more favorable is, of course, the prognosis in those cases where the localization of the process permits of the preservation of the trigone-portion of the bladder. It was of great interest to find that the peritoneum had not become infected.

The experience which, so far, I have had of the method above described, leads me to expect that this same method may through further improvements of the technique be developed in a way rendering it less dangerous and at the same time more serviceable. The final verdict on the relative value of the method, I leave to the future and to the trial of my colleagues.

One conclusion, however, I consider myself justified in drawing now. An isolated portion of small intestine may without risk of dangerous resorption of the contents be used for the passage of the urine. Should, also, its employment as a receptacle for the urine prove practical, the prospect opens to me of obtaining a combined plan of treatment of ectopia vesicae, by making use of the experiences which, through a hard struggle, have been gained by employing separately the methods of implantation and of direct closure.

This line of treatment would, briefly sketched, comprise the following steps, performed at suitable intervals:

1. Laparotomy and resection of a loop of small intestine which is temporarily fixed along the middle line of the anterior abdominal wall, in such a way that its upper end is drained according to Witzel immediately above the upper margin of the defect, eventually through the rectus muscle.

2. Excision of the mucous membrane of the bladder, the muscular coat being left. Only around the orifices of the ureters an elliptical piece is resected, including the entire thickness of the vesical wall. The abdomen is opened by an incision through the whole height of the remaining vesical wall. The loop of intestine is drawn forward. Behind it, the peritoneal cavity is again closed, so that the piece of bowel comes to rest upon the exposed muscular coat of the bladder. The trigone portion is implanted into the lower part of this loop. In this way we have obtained a closed bladder, which at its upper end is drained in a manner enabling the employment of an ordinary vesical-fistula bandage. The urine has entirely been shut off from the open neck of the bladder and the urethral groove, both of which still remain. The greatest obstacle to the closure of these parts has consequently been removed.

3. Osteotomy of the pelvic ring and subsequent closure of the neck of the bladder and urethra. Lastly, the free-dissected ends of the pelvic bones are brought into contact at the symphysis.

4. By the aid of a transverse incision above the symphysis pubis the lower opened end of the bowel may finally be joined to the free-dissected upper border of the closed neck of the bladder; and

5. The opening through which the loop of intestine has been drained is closed and the skin edges are brought into apposition in front of the newly-formed bladder.

It is evident that the first part of this line of treatment would not materially differ from the method advocated by Rutkowski-Mikulicz. Whether the scheme of these surgeons already has been put into practice, I do not know.

I hope that the mode of treatment now suggested by me will not be taken for anything else than what it really is — a mere outline of a method calculated to overcome some of the stumbling blocks of the "ideal treatment."

Lastly, the following general conclusions as regards the treatment of ectopia vesicæ may be stated:

1. At the present imperfect standpoint of our treatment of extroversion, I consider it wrong to insist upon the superiority of one special line of treatment without taking due regard to the age of the patient, the degree of development of the deformity, and secondary changes present.

2. The method of implantation of the ureters is no doubt the one which quickest leads to the goal, but, on the other hand, it necessitates the postponement of the treatment until a later period of life and involves, notwithstanding the improved technique of our days, greater dangers than the direct closing method.

3. The isolated closure of the urinary passages must be regarded as the ideal therapeutic measure; the investigators should, therefore, never grow tired in their endeavours to overcome the difficulties attending this way of treatment.

4. With regard to the technical modifications which have been tried and recommended by me in connection with autoplasty, as well as the methods of direct-closure of the bladder and of implantation of the ureters, I beg to refer to this paper.

# TRANSACTIONS OF SOCIETIES

## CHICAGO SURGICAL SOCIETY

A regular meeting was held June 21, 1907, with the President, Dr. David W. Graham, in the chair.

### DOUBLE CONGENITAL CERVICAL FISTULA

DR. WILLIAM HESSERT: This boy whom I show you had a double congenital cervical fistula from the time of birth. There were observed two little points at the lower part of the neck at the anterior border of the sterno-cleido-mastoid muscle, from which a mucoid substance exuded. This continued for many years, until finally treatment was instituted and an attempt made to close the fistulæ by cauterization. The discharge began to be purulent, so that when I saw him, a few months ago, there were two minute openings in the lower part of the neck, one on either side, symmetrically placed, from which pus could be expressed. A hard cord extended up into the neck and disappeared at the angle of the jaw. Considerable pus came out through the fistulous opening. I was unable to pass a probe up into the openings, into the pharynx, but it was evident there was a communication there, because, if bitter fluids were injected, he was able to detect the taste.

The treatment was radical. I operated on this side first, this being the side most affected. I made a long incision and dissected out this strand, which is almost the size of a lead pencil, and which was superficial up to the hyoid bone, and in that situation it dipped down deeply. While dissecting deeply, the strand of tissue tore off near the pharynx and I was unable to find the proximal end. I was unable to demonstrate positively a direct communication, by means of a probe, between the sinus and tonsil, but that is where it terminated. On the left side it terminated in the pharynx. I was able to dissect it out on the left side in the same way, and it took the same course as the other one; beginning down here (indicating), and dipping down deeply, I was able to follow it up to the pharynx and tie it close up to that organ. Both wounds healed without any reaction, by primary union. I did not drain this side, but drained the other, on account of the duct being torn off. He had some enlarged lymphatic glands on the left side, which I did not remove, and there is some induration to be felt there yet.

I had intended to bring a section of the ducts, so as to show the fibrous structure, with the lumen lined by cylindrical epithelium, but was prevented. It was to show the result and present the case that I had the patient come here to-night.

The treatment in these cases is radical. Any sort of injection treatment and cauterization would do no good.

DR. PLUMMER: What was the relation of this to the deep artery?

DR. HESSERT: It went to the outer side of the artery, deep down below the hypoglossal nerve. This nerve and the hyoglossus muscle I lifted up and got in from below; the artery was on the inner side of the duct. This was done about two weeks ago. The discoloration which you see is due to Harrington's solution. I have been using this solution for more than a year; I find it is rather strong and causes a little trouble of the skin at times, but I like to use it very much.

DR. GRAHAM: In your dissection, did you meet with anything like a tubular stricture?

DR. HESSERT: It was a thick, hard band which could be easily held up and dissected out without any particular trouble. It was a simple matter to follow it down.

DR. FULLER: I would like to ask Dr. Hessert, if he thinks it is possible to cure such a case permanently, unless every vestige of the sinus is dissected out?

DR. HESSERT: Cervical fistulæ are notorious in this respect, that if we leave much of a vestige they will recur.

DR. FRANK: Why do you call it cervical fistula?

DR. HESSERT: Because that is the name usually applied to it.

DR. GRAHAM: I think it is proper to call them cervical fistulæ, instead of bronchial, at times.

DR. FRANK: My experience in dissecting out these fistulæ is, that the nearer you get to the top, the thinner they become. I have never had a case in which the fistulæ returned after every vestige was thoroughly dissected.

### FRACTURE OF THE PATELLA

DR. WILLIAM HESSERT: This man sustained a fracture of the patella. There is nothing remarkable about the result, but I present the case as an

excuse to say a few words about the treatment of fracture of the patella.

In the first place, in regard to the indications for operation, I am firmly convinced that all fractures of the patella, where we have access to a modern hospital, should be operated on.

It has been said, that if you put a patient on a table and ask him to raise his leg, if he is able to do so, this would indicate that the capsule on either side is uninjured, and the main strength of the extensor muscles is retained; whereas, if the individual is unable to lift his leg from the table, there is undoubtedly extensive laceration laterally, and the case should be operated on. I do not coincide with that view. I have never yet seen a case operated upon where there was not shown to be extensive laceration laterally of the capsule; there was always interposition of shreds of fibrous tissue between the bone surfaces, with blood clots, which would make bony union improbable. I am sure that operative treatment is the best and surest.

Regarding the incision, I made an incision with the convexity downward. It is said by some, it ought to be made with the convexity up, so that the scar will not be subject to pressure. That may be material, and possibly it is not.

In regard to the further operation, I believe the simplest way to suture it is to throw a suture of kangaroo tendon or catgut around the periphery of the patella and bring it together in that way. Before doing that, however, it is essential to get rid of the blood clot, and at this point is is important not to touch the wound with fingers whatsoever. Nor do I irrigate it, because both of these procedures may cause irritation, especially infection. I swab out the joint carefully with sponges, held on forceps, and the finger is not put into the wound at any time. Even irrigation of the joint with salt solution I consider unnecessary and useless, because, in my experience, I happened to have had at one time two cases operated on in one week, in one of which I washed out the joint with salt solution, and the other I did not touch. The one that was irrigated showed slight indications of irritation, not infection, which caused me considerable worry, so that since that time I never wash out the cavity, but swab out the blood clot with sponge. The wound is not touched with the fingers, which is one of the most important parts in the treatment of fracture of the patella. A circular suture of catgut or aluminum bronze is thrown around the patella. I believe an important feature is to suture carefully the lateral lacerations of the capsule. When that is done the skin is drawn over and sutured.

In regard to the aftertreatment, I believe that is really as important, if not more important than the operation itself. This consists in the early mobilization of the joint, viz., the early institution of passive motion and massage. I have studied cases side by side, where one patient was allowed to move the knee-joint after ten days, while another was kept in a splint for two or three weeks, and those cases which were mobilized early, that is, allowed to move the joints after the tenth day, did better than the others in my practice. About the time the sutures are ready to come out I begin to make passive motion, or before that time. I no longer put the knee in a splint, but have the patients make passive motion every day or do it myself. One patient, this particular one, was walking around in two weeks and took such good care of himself, that it was not necessary for me to make passive motion, as he did it himself.

The result, as you see, is very good. He suffers no inconvenience except in going downstairs. This was a transverse fracture; the upper fragment was a little larger than the lower.

I consider it very essential to institute early passive motion and early massage, and in that way you accomplish free mobilization and get a much better result than if the knees be put for three or four weeks in plaster casts.

DR. GRAHAM: Theoretically, I should think, a finger that is gloved is as harmless as a piece of gauze on a staff.

DR. HESSERT: Yes, theoretically, but I doubt, if a practical test was made, whether a gloved finger would be found as safe as a sponge that is taken out of a receptacle with which to swab a wound. The possibility of contamination is greater with a glove, because with it you touch the skin and the skin is not perfectly sterile, and it has been my experience that it is best not to touch the wound, if possible. You need not do it, but do the suturing with forceps, and then it will not be necessary to touch the inside of the joint with the gloved or uncovered finger. I have found that if the latter is done it is liable to cause trouble.

DR. JACOB FRANK: I would like to ask Dr. Hessert, if there was not a blood clot, whether he would make the incision he has described? Personally, I think, if there is no blood clot, that incision is unnecessary, because the patella can be sutured with kangaroo tendon or silver wire by making a puncture and passing around it. I recall three cases which I sutured with kangaroo tendon, and had good results, without any suppuration, without any trouble whatever, and without opening the knee-joint. In one case, as I remember, the knee was very much swollen. No doubt there was fluid in there, but after several days it subsided. I

think Stimson advocated this method, and reported a number of cases.

As to the question of bony union, we have no evidence that there is bony union after a fracture of the patella. In Dr. Hessert's case one can readily feel a ridge. The same thing could be felt in my cases. It is not a bony union, in my opinion, and every case I have examined occurring in the hands of other practitioners was the same. I could always feel a ridge. However, Dr. Hessert has obtained a remarkably good result in this case.

DR. GRAHAM: It seems to me, a ridge is the best evidence we have of bony union.

DR. FRANK: I did not mean to say a ridge, but a fissure.

DR. SAMUEL C. PLUMMER: It seems to me, if there is no blood clot, and the edges of the wound are turned in, there may be interference with bony coaptation, and consequently with bony union. I agree with Dr. Hessert that it is not necessary to drill the bone, as a great many surgeons do, and as nearly every surgeon used to do. Especially is it important to unite the lateral portions of the capsule with the aponeurotic extension of the quadriceps extensor laterally, because they play an important part in the function of extending the knee.

DR. HESSERT: In regard to Dr. Frank's suggesting the use of subcutaneous suture, I would condemn it unqualifiedly. The strength of the extensor apparatus is invested in the lateral aponeurotic extension of the quadriceps. If you suture the patella subcutaneously, allowing flaps of fibrous tissue to get between the flaps, and leave the torn capsule, you might as well treat the case with an elastic apparatus, or not operate at all. To get bony union one should remove the blood clot and remove the aponeurotic flaps which fall between the two fragments. It is very essential to remove the blood clot, and I have never operated on a case yet without having had considerable blood clot. I do not wait for absorption of the blood clot. It is essential to suture the lateral portions of the capsule and the aponeurotic extension of the quadriceps extensor, because the extensor muscle gets a good deal of its strength from this structure. I do not favor the subcutaneous method in these cases, because it does not follow out or meet the indications that are present in treating such a fracture. The reason we get non-union is because fringes of the capsule get between the broken ends of the bone.

In regard to the question of drilling, I presented a case a number of years ago of comminuted fracture of the patella treated by drilling; but where there are only two fragments, usually a large upper one and a smaller lower one, the fragments can be brought together nicely by a circular suture passed around the two fragments.

PERFORATION OF THE STOMACH FROM ULCER

DR. WILLIAM HESSERT: This is the third case of perforation of the stomach which I have reported and presented before this Society. About a year ago I presented a case of acute perforation of the stomach upon which I had operated, and which got well. I also reported another case of chronic perforation of the stomach which was mistaken for carcinoma, but which subsequently cleared up and proved to be a chronic perforation.

The history of this case is this: This patient has suffered from stomach symptoms, dyspeptic symptoms, for a number of years. Three or four times he has vomited blood. He has had pain, more or less, in the region of the stomach for a long time, particularly after taking food, also distress after taking food. Some months ago the pain became more severe. As I remember the history, there is no record, however, of a sudden sharp onset of pain, with symptoms like peritonitis; but the pain persisted, and in the meantime, he informs me, he has lost thirty-five pounds in weight. He is run down considerably. The pain kept up in the region of the left hypochondrium, and when I first saw him he was greatly emaciated; he had a tumor in the left hypochondriac region a little below the costal arch. This tumor was not movable, but was tender, so that its outlines could not be determined. Inflation of the colon with air showed that the colon passed below a mass which was from four to six inches in diameter; and the diagnosis of this mass, which evidently was an abscess from the temperature, the leucocytosis, the extreme tenderness, and in fact beginning redness in that region, indicated clearly we had pus. However, I was unable before the operation to determine just what organ was involved or to make an absolute diagnosis, although we had a clear history of stomach trouble dating back years, and a history of hemorrhage from the stomach. On incising the abdomen, I at once encountered pus under high tension. There was an abscess cavity found about the size of an orange, and I could not determine even then what organ was involved. I did not care to break up any of the adhesions in my search, with a view to clearing up the case further, and let it go at that, simply packed and drained the cavity. After the first or second dressing, stomach contents escaped through the tube, showing we had a perforation of the stomach that was chronic, preceded by a perigastritis, the perforation occurring slowly and forming a circumscribed abscess in the region of the

stomach, and between it and the anterior abdominal wall. It was open for about three weeks; it healed up kindly, and while the patient feels much better than he did, he still has stomach symptoms. He vomits. He has no excess of hydrochloric acid, nor of lactic acid. I am inclined to doubt the accuracy of the stomach examination. His general condition is better, but far from being good, because, I am sure, he still has the ulcer. An infection outside of the stomach has been drained. There is no doubt at all in my mind that he has an ulcer, and I present him to you with a view to getting your opinion as the advisability of performing a gastroenterostomy, which I think would be the proper thing to do after he gets stronger. However, there is no hurry about it, and it may be that the stomach symptoms will subside. Briefly, in this case we have a chronic perforation of the stomach, perigastritis, the formation of an abscess between the abdominal wall and the anterior wall of the stomach, which has been evacuated and which has healed, still leaving an ulcer. Ordinarily, in these chronic cases, the ulcer is generally situated in the lesser rather than in the free peritoneal cavity. We have in this case a very uncommon thing — a chronic perforation on the anterior wall of the stomach, with the possibility that this might have eventually emptied itself. It is one of those cases where nature might have cured the ulcer. It is not at all improbable that in time this abscess might have worked through the wall and ruptured externally.

DR. FRANK: I would like to ask Dr. Hessert as to the color of the contents of the abscess.

DR. HESSERT: It was yellow pus, rather foul-smelling. We could hardly call it sanious pus; it was foul-smelling, typical pus.

DR. GRAHAM: We could not expect any better result than what we see in Dr. Hessert's case in four weeks' time, and the treatment depends very largely upon the behavior of the local condition. I would suppose that the ulcer has healed. Is that your idea?

DR. HESSERT: My idea at first was that it had not healed, because he was still vomiting. He has not vomited for the last ten days, and may be the ulcer now has healed. The fistulous tract from the stomach wall to the abdominal wall has healed; but whether the ulcer in the mucosa has healed or not is the question.

DR. GRAHAM: The fact that the fistula has healed is an indication that the ulcer itself has closed up and repaired.

DR. HESSERT: There may be an erosion at the site of the old ulcer.

DR. FRANK: It is superficial tissue, anyhow. If you could look at it, you would find it closed off from the wall of the stomach, and inside of the stomach there would be evidence as yet of cicatricial tissue in the old chronic ulcer. It is not an active ulcer, but there would be evidence of an ulcer that is scooped out.

DR. GRAHAM: Evidence that there had been an ulcer, but not evidence that there is an ulcer going on. The sinus has closed; connective tissue has formed in the stomach, and, by contraction and pressure around, the ulcer has been aided in healing. I believe that has taken place.

DR. HESSERT: I coincide with you in that statement, but would not the position of the abdominal wall favor the healing of the ulcer?

DR. GRAHAM: If this came from the lesser cavity, you have got some distance between the perforation and the skin.

DR. HESSERT: It did not come from the lesser cavity.

DR. GRAHAM: It didn't?

DR. HESSERT: No. This pus was between the anterior wall of the stomach and the abdominal wall.

DR. FRANK: That is quite different. There you get normal tissue; here you have active tissue which is liable to become cancerous, and it is pathological. In this case the inside of the stomach wall is not continuous with the mucous membrane. There are evidences of a scooped out cavity, and you will find the presence of cicatricial tissue there.

DR. WILLIAM FULLER: Owing to the appearance of the patient presented by Dr. Hessert, I would feel more concerned about the possibility of the presence of other ulcers, than about the one which made the operation necessary. About two years ago I presented a case at a meeting of the South side branch of the Chicago Medical Society; this case was a woman who had had several attacks of hematemesis, and for which internal medication afforded no relief, except for very short periods, when the hemorrhages would recur with great severity. I operated on the woman, opened the stomach and found a large ulcer which bore all the evidence of having been the seat of the bleeding; the ulcer was completely excised, and the opening closed. On further search, near the pyloric end of the stomach, two other ulcers which had apparently healed, but which had left the stomach wall very thin at the seat of the ulceration, and protected only by scar tissue, were also excised, and the openings closed as before. The vomiting of blood did not recur; no further discomfort before nor after meals has ever been complained of since the operation, and the patient has gained thirty pounds in weight. I quite agree with the sugges-

tion that it would be proper to wait in the case presented to-night until the condition justifies the suspicion of further ulceration, because it is scarcely more than four weeks since the operation was performed.

ESOPHAGEAL STRICTURE DUE TO TYPHOID FEVER

DR. SAMUEL C. PLUMMER: I showed this patient to the members of the Society February 6, 1905. At that time he had a gastric fistula, the result of a gastrostomy. The gastrostomy was performed April 21, 1905. This case is interesting in its pathology, in that the stricture of the esophagus was due to an attack of typhoid fever; and then another interesting point was the great length of time during which he had an impassable stricture — May 4, 1905, to September 29th, more than four months, during which we could not pass the smallest bougie, nor could the patient swallow a drop of water. On the latter date the patient was able to swallow a fine silk thread which was pulled out through the gastric fistula, and by pulling a larger thread through after a smaller one we were able to dilate the stricture and later on to use bougies, and at the time I showed him before the Society we could pass a No. 28 esophageal bougie. He still had a fistula.

On February 20, 1905, the patient was anesthetized and the gastric fistula closed by dissecting away the scar tissue and separating the stomach wall from the abdominal wall sufficiently to insert sutures in the former. The abdominal wall was sutured, and primary union took place. Since that time we have occasionally passed large-sized bougies through the esophagus, and there does not seem to be any tendency to tightening down of the stricture. Since then he has gained in weight, and is now strong and healthy. I thought possibly that the fact that the stomach was still attached to the abdominal wall might cause some disturbance, since I did not open the peritoneal cavity; but dissected the stomach wall around the fistula far enough so I could sew it together without entering the general peritoneal cavity at that time; the patient, however, does not complain of any discomfort.

DUPUYTREN'S CONTRACTION

DR. SAMUEL C. PLUMMER: This is a case of Dupuytren's contraction. The patient was operated on four weeks ago. The wound healed by first intention, but after taking out the stitches the line of sutures broke down and a little infection occurred. This infection, however, while it delayed healing somewhat, was only superficial.

I dissected out the palmar fascia; but the greatest trouble is in getting a flap where you will not get some sloughing of it. The thickened palmar fascia comes right up next to the skin, and the layer of adipose tissue between the skin and the fascia is absorbed. The skin and fascia are one layer. When you dissect the fascia out, there is such a thin layer of skin that it has poor nourishment. In one case I used the V-shaped flap of von Busch, and the tip of the flap sloughed, so in this case I thought I would get a flap from the side where there was good nourishment from the proximal end. None of that sloughed, although the skin was cut off thin.

DR. FRANK: There is some question as to whether this is a case of Dupuytren's contraction or so-called hammer finger. I would like to ask Dr. Plummer, whether he opened the tendon sheath?

DR. PLUMMER: No.

DR. FRANK: I know a family, in which three girls have these two fingers drawn down like this (indicating). I have an idea that where the fingers are drawn down like th t (indicating), the trouble lies a great deal in the tendons. I believe Dr. Plummer was present when Dr. Weir, of New York, showed a contracted finger, which was a little different from that shown here. In taking hold of something the finger would become irritated, so that it would be drawn down. I think Dr. Abbe made a dissection of Dr. Weir's finger, and it was found the trouble was in the tendon sheath, or, at least, the beginning of the trouble was in the tendon sheath. Of course, Dr. Weir underwent an early operation. If he had delayed operation in his case, the finger would have become contracted in the same way. If the case were seen by some surgeons, they would say it was an instance of Dupuytren's contraction. This case proved the trouble was in the tendon sheath. The tendon sheath was opened. He had no theory to explain the trouble. The tendon sheath was left open in Dr. Weir's case; it was packed with gauze, he has a good finger now. He has been relieved of his trouble. The reason why I spoke about these cases is, they are not clearly and thoroughly understood yet, particularly the pathology and etiology of these contracted fingers. We have had a great many cases of Dupuytren's contraction exhibited, and there has been much discussion in our Societies as to whether or not they were really typical cases of that condition. I am not satisfied in my own mind that this was a typical Dupuytren's contraction.

DR. WILLIAM FULLER: It is true, as Dr. Frank has just stated, that most all cases of contraction in the fingers are described by some as Dupuytren's contraction; but the impression Dr. Frank evi-

dently received from the description given by Dr. Weir of his own personal case at the Atlantic City meeting in June, is not correct. Dr. Weir described his case not as a Dupuytren's contraction, but an affection of the tendon, which at times interfered with the use of the finger. There are a few points which should differentiate a typical Dupuytren's contraction from a contraction of the fingers due to other causes. In a typical case of the former the terminal phalanx of the affected finger will not, as a rule, be markedly flexed, and, as Dr. Plummer has pointed out, the skin will slide easily over the affected and flexed finger if the contracture is not a Dupuytren's; whereas in the latter deformity it will be adherent. I feel sure, from the description of the case as outlined by Dr. Plummer, that there is no doubt as to the correctness of the diagnosis, and that he is to be congratulated on the excellent result obtained by the operation.

DR. D. W. GRAHAM: In regard to this particular case presented by Dr. Plummer, I have no doubt at all of its being one of Dupuytren's contraction. I have no doubt of Dr. Plummer's ability to distinguish between that and other contractions of the palm of the hand; nevertheless, in most of the cases we see which come to the operative stage, there is more of the palmar surfaces of the two fingers involved than there is here. Years ago we did not dissect out the palmar fascia; we made subcutaneous multiple incisions, which were not satisfactory. It does not seem to me necessary to make the large flap. With a simple linear incision lateral flaps can be made by undercutting, so that you can dissect out the fascia, and thus you avoid making a large flap. In fact, you will have less difficulty in dissecting out the palmar fascia by means of a simple linear incision, and I think you will find that you will get better results in that way than you will if you make a flap.

DR. SAMUEL C. PLUMMER: There is no doubt about this being a case of Dupuytren's contraction. In the first place, the condition was typical. The fingers were flexed and could not be extended even under an anesthetic. When we tried to extend them a little, the fascia stood out in line, becoming narrower toward the wrist, and getting wider between the two fingers. Dupuytren's contraction involves the two fingers on the ulnar side, very seldom the middle finger, and almost never the index finger. The condition of the skin itself is generally characteristic. The skin, at the place where the process has advanced the most, has been thrown into folds and sometimes dimples, where the fibers, which run at right angles to the skin, have become contracted and drawn the skin up, and the skin itself is not at all movable over the fascia, but united to it. After dissecting the fascia out, the tendon sheaths, which were exposed, were not involved, because as soon as the fascia was cut, one could extend the fingers. My idea in making a somewhat curved flap, and making it with a lateral proximal base, was that if the line of incision contracted, it would not contract in a straight line, or a line corresponding to that of the contracted palmar fascia.

### TUBERCULAR EPIDIDYMITIS

DR. SAMUEL C. PLUMMER: I want to show this specimen which I removed a few days ago. It is one of tubercular epididymitis in an otherwise healthy young man. About the first of January he noticed some swelling in the testicle. When I saw him a month ago, he had decided and characteristic nodules in the epididymis. There was also a fistulous opening on the skin of the scrotum. I thought also something could be felt in the body of the testicle itself. There was slight hydrocele also. I thought it best to do complete castration on that side, and not an epididymectomy, but to take out the epididymis and testicle all in one. I made an elliptical incision, and took out the testicle and sac, without opening the sac. When I opened the sac there was a beautiful example of tubercular inflammation of the peritoneal membrane, just like a miliary tuberculosis. The testicle was not involved except on the serous surface, where one could see the miliary tubercles. There were also some adhesions between the visceral and parietal layer of the tunica vaginalis testis.

### TWO CASES OF PYLORECTOMY

DR. SAMUEL C. PLUMMER: I desire to present some microscopic specimens of cases of stomach trouble. I will report these cases briefly.

CASE 1. E. E. P., widow, 56 years old. Family history negative. January 27, 1906, was operated upon for carcinoma of the breast.

The stomach trouble began rather abruptly in the early part of 1906. Pain, distention, vomiting.

I first saw the patient early in April, 1906. Analysis of stomach contents after an Ewald's test-breakfast, April 14, 1906, showed acid reaction. Total acidity, 25. Free hydrochloric acid, 8. Lactic acid absent. No Opler-Boas bacilli.

On June 23, 1906, she was examined by Dr. B. W. Sippy, whose findings in part were as follows: "Tumor mass easily palpable just to left of median line, tender and extending two inches transversely. Upon distention with gas, tumor moved to right and downward. Examination of stomach contents shows total acidity, 83. Free hydrochloric acid, 53. No Opler-Boas bacilli or sarcinæ."

Examination of stomach contents after a test-meal

at Mercy Hospital, June 26th, gave the following results: Total acidity, 9; free hydrochloric acid, 0. No blood. An examination of the feces, June 27, showed a Gram-positive stool.

The operation was performed June 28, 1906, at Mercy Hospital.

CASE 2. A. M., female, married, aged 65 years. Family history negative. Trouble began in October, 1901. Pain, vomiting, blood in vomitus.

In 1903 examinations of stomach contents showed total acidity ranging from 120 to 10, and free hydrochloric acid from 63 to 0. No lactic acid. Blood generally absent, but occasionally a little present.

*Diagnosis:* Ulcer of the stomach. Discharged Nov. 13, 1903, greatly improved, after being under the care of Dr. B. W. Sippy, in the hospital, for several weeks.

Patient was again in the hospital from July 14th to September 14th, 1906, during which time blood was repeatedly found in the stools. The diagnosis at this time was gastric ulcer with pyloric spasm. Discharged greatly improved.

The relief on this occasion was of short duration and patient returned to the hospital Oct. 18, 1906.

The operation was performed at the Presbyterian Hospital, Nov. 5, 1906.

These cases are similar in many respects. Each one had quite a large tumor and some enlarged glands in the mesentery adjoining. The macroscopical appearance, to my mind, is that of carcinoma. I operated with the presumption, in each case, that it was a carcinoma. I made a partial gastrectomy; it is more than a pylorectomy, taking off a third or more of the stomach, beginning on the lesser curvature near the esophagus in a line which Moynihan and the Mayos have described as being the line of incision and cutting off the duodenum. I did this operation with the Moynihan clamp; turned in the end of the duodenum, sewed it off, and sewed up the stomach with two sutures. I used Pagenstecher linen-celluloid thread throughout. I did a posterior gastroenterostomy, using the Moynihan clamp again, and I did not turn the jejunum around to get the line of peristalsis of the jejunum in the same direction as that of the stomach, but did the operation of the Mayos, leaving the jejunum in its position without turning it around. In both cases the results were excellent. The patients made practically uninterrupted recoveries. The first patient did not vomit even after the operation; although the operation was long in each case, the amount of shock was comparatively small, and the amount of blood lost was very slight. I ligated the arteries before cutting the viscera. In removing a portion of the stomach, I also took out neighboring portions of the omentum — in fact, including all the enlarged glands which were present, taking all out in one piece.

The specimens are here, and I shall be glad to have you look at them under the microscope.

I will say that the specimen in Case 1 was pronounced by several pathologists an ulcer with a great amount of inflammatory tissue surrounding it, while one pathologist contended that it was a scirrhous carcinoma.

The specimen from Case 2 was agreed by all to be an ulcer with a large amount of fibrous tissue surrounding it.

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# A REGULAR MEETING OF THE CHICAGO GYNECOLOGICAL SOCIETY, APRIL 19, 1907

DR. JUNIUS C. HOAG, PRESIDENT
DR. FRANK W. LYNCH, EDITOR FOR THE SOCIETY

## EXHIBITION OF SPECIMENS

DR. T. CLARENCE WEBSTER: I have been asked to show some specimens to-night, and have brought down a few that are interesting because of their rarity and because of special features connected with them.

### REPORT OF TWO CASES OF OVARIAN PREGNANCY

The first specimen I show is one of ovarian pregnancy; it is the specimen I described three years ago, but which I have never shown to this Society. It was fully worked up for the transactions of the American Gynecological Association.

This specimen came from the practice of my friend Dr. Evans of La Crosse, Wis. It is an undoubted case of ovarian pregnancy, the tube being distinct from it, the pregnancy forming a swelling about three by two inches, the amniotic cavity being perfectly preserved in the middle portion of the mass, and surrounding that the chorion with extravasated blood. There is a thin outer capsule consisting of stretched ovarian tissue from which the Graafian follicles have practically disappeared. The amnion was perfectly preserved, but in the cavity there was no embryo.

This specimen is the second one described in

this country, the first one being shown a year before by Dr. Thompson of Portland, Maine. His specimen was not quite so well preserved as this one.

It is my good fortune now to be able to show another ovarian pregnancy almost identical in size and shape, but with a larger amniotic cavity and the embryo preserved. A remarkable thing about this specimen is that it came from the same town of La Crosse, Wis., from the practice of another friend of mine. It is remarkable that for so many generations there should have been such scepticism regarding ovarian pregnancy, and shortly after the first undoubted demonstration of a specimen by Van Tussenbrock of Holland, two splendid specimens should come from one small town in Wisconsin.

My second specimen is almost identical with the first, the microscopical features being very similar

### FIBROID TUMOR OF THE LABIA

Still in the category of the unusual, I show this large swelling, which you see is a mass covered with skin. It is the largest labial tumor of which I have any record. It had a comparatively small pedicle, and was removed from a woman in labor by a friend who sent the specimen to me. It is a pure fibroma. The woman carried it for years and never had it attended to because it gave her no trouble, but consented to the removal on account of the pregnancy.

### FETUS AMORPHOUS ANIDEUS

The next specimen is also one of great rarity, which I owe to Dr. Hagens of this city. It is a fetus amorphous anideus, one of the varieties of allantoido-angiopagous twins. This is the second one I have described, my first case having been published in 1895. A vertical mesial section has been made, showing a large edematous mass of tissue covered with skin, with a few irregular bones, and nothing else of much importance. It was attached to the placenta by membranes in which ran an artery and vein. There is a little hair on the outer surface. The fetus amorphous anideus is always part of a twin gestation.

These specimens are of great interest from several points of view, though I think the relationship to the vascularization is the most interesting. There can be little doubt that a twin of this character represents permanent vascularization by means of the omphalo-mesenteric vessels, and not by vessels coming from the pelvic vessels in the ordinary manner. There are fetuses, for instance, in which there is no pelvis at all, consequently no hypogastric vessels from which the chorion could be vascularized. We do not find the ordinary arrangement in the vessels of the cord in these cases, there being usually one artery and one vein, corresponding to the omphalo-mesenteric rather than the so-called allantoic arrangement.

### CASE OF TRUE HERMAPHRODISM

Perhaps the most remarkable specimen is one that I have not yet demonstrated before any society. It is a malformation, which occurred in the practice of Drs. Ferguson and White in Moncton, N. Y. The patient was a farmer about 34 years of age. He was admitted to the Moncton hospital with acute abdominal symptoms following the kick of a horse. There was a swelling in the scrotal region, and as he had always had what was considered a hernia there, it was supposed the kick had injured this hernia, that it had become strangulated. An incision was made over the hernia, but instead of bowel or omentum, there was found what appeared to be a normal female uterus with ovaries and tubes, the uterus being attached to the prostate. Those parts were removed, and as there was general peritonitis, the belly was opened in the middle line, but as the patient was in such a bad condition, practically moribund, nothing was done except to examine the pelvic cavity. The patient died shortly after leaving the table.

The specimen, which is somewhat altered by dissection, consisted of the body of a uterus similar to that one would get after a supravaginal amputation, there being a slight depression of the fundus. There was a Fallopian tube on each side, and two structures in the position of the ovaries and which resembled the latter except that they were smoother; they looked like swollen ovaries. On both sides there was a round ligament and a broad ligament; on the left side the latter contained a cyst about three inches in diameter. On dissection a vas deferens was found in each broad ligament, close to the uterus. It was small in its upper portion, but increased as it passed downward toward the cervix, where it measured 5 mm. transversely. The two bodies which looked like ovaries were not ovaries at all, but testicles; one was up inside the ring, the other in the scrotum. It is interesting to note that the uterus was not fetal, but adult. What does that mean? It can mean only one thing; no one ever saw a uterus of this character, without ovaries, in a female. It is impossible for a uterus to reach adult size in the human female without ovarian tissue being present, consequently one can infer that although no ovarian tissue was present in the specimen, it must have been present in the man; consequently the case must have been one of true hermaphroditism, of

which only a few cases are on record. Drs. Ferguson and White observed a small mass resembling an ovary when the abdomen was opened. It was not carefully examined, but there can scarcely be a doubt that it was an ovary.

The testicles resemble those of an adult, but no spermatozoa were found. The man in earlier years was the father of twins, so there is no doubt that the testicles were active formerly, at least. There is nothing corresponding to a separate epididymus, but the rete testis opens into a series of convoluted tubules in the broad ligament in a position corresponding to the organ of Rosenmüller in the female, and they communicate with these large tubes (vas deferens or permanent Wolfian ducts) which run down the sides of the uterus towards the cervix. The Fallopian tubes have the characteristics of the female Fallopian tube except that there is a less marked condition of fimbriation at the outer end. One of the fimbriæ passes towards the testicle, corresponding to the ovarian fimbria in the female.

### EXHIBITION OF CASTS

Finally, I want to show some casts. I have long been a believer in the value of casts for teaching purposes, and have made a great many of them, more than one hundred. They are of great value in illustrating various cases in teaching; they represent various plastic procedures which may be carried out on the female perineum, vagina, cervix and abdominal wall. When one has a case for demonstration in clinic it is interesting to be able to show variations of the condition under consideration. We cannot always have the patients at hand with these variations, and thus casts are very serviceable. The perineal casts are taken in the lithotomy position, the vulva being shaved and covered with vaseline. The plaster is mixed with an equal quantity of warm water, and when in a nice soft condition, not too liquid, it is poured over the parts, being prevented from running by strong paper. From the negative then derived, positives are made. There are often special points in a case which can be registered by a cast and which may be preserved for all time. For instance, here is the cast of the perineum of a young primipara. It is of interest in teaching for this reason, that the woman was delivered of a child and a repair made, and she came to me complaining of incontinence of feces and gas. The parts seemed to be all right, and there was apparently a good perineum, yet the latter consisted only of skin. The anal sphincter had not been restored and another operation was necessary.

Here is a specimen recently made showing a complete tear into the anus. Various attempts at closure had been made, but all had failed, and extensive destruction of tissue had resulted. In this case the patient was syphilitic, and this was probably an important cause of the various operative failures.

Here is another one of interest, a large everted urethral mucosa, exquisitely tender, produced as the result of acute traumatism. The patient's perineum had been repaired; coitus was attempted by the husband early and forcibly, and as a result the urethral mucosa was everted and a very painful condition produced. The case required an operative procedure.

Here is an interesting specimen of prolapsus uteri with a nodule on the cervix. That nodule turned out to be a very early carcinoma, the second one in my experience of such small size.

The next specimen is a huge procidentia in a woman of 70, with extensive ulceration. This had been present many years before the woman came to the hospital. This case is interesting from several points of view. I have had several cases of procidentia in old women on whom I have operated in recent years, two having been in their seventieth year. Naturally one is averse to operating at such an age, but this woman refused to endure her misery any longer, and was willing to take all the chances of operation. The latter was carried out with Schleich infiltration of the tissues. I have used local anesthesia in eight similar cases in women over sixty with absolutely good results, although the operation was very extensive. I have come to practice the following procedure for extensive procidentia, viz: removal of the uterus for the purpose of getting at the broad ligaments; extensive anterior colporrhaphy, extensive posterior colporrhaphy, the broad ligaments being drawn down and stitched onto the sides of the vagina. I have never had a failure, and have practised the method for several years.

### ANENCEPHALUS

DR. CARL WAGNER: I have here a case of anencephalus. While we do not believe in maternal impressions, I would like to mention the coincidence which is to be noted in this case. This lady had given birth to normal children before, and when she was in the first month of this pregnancy, she went next door to see a friend who was in labor. On entering the room she saw on the table a newly born baby with its skull crushed in. It frightened her and she went home, and afterwards gave birth to this baby. I only mention this as a coincidence, there is nothing particular about the labor.

### TUBERCULOSIS OF THE KIDNEY

The next specimen is a kidney. This case was treated two months for cystitis, and then a consultation was held, and the surgeon thought the 17-year old girl had an ovaritis and should be freed of the troublesome ovary. I saw the case and diagnosed it as tuberculosis of the kidney, with cystitis as a consequence of the tuberculosis. This is the abscess which we found. The ovary was normal, as far as we could find. Of course removal of the kidney cured the cystitis. We catheterized both ureters and found the urine from the right kidney normal and pus in that from the left kidney, but no bacilli in the pus, but there were bacilli on specimens taken from the wall of the abscess which you will find on the upper portion of the kidney.

### UTERINE POLYP

The last case is a large polypus of the uterus; the smaller mass is the uterus, the larger, the polyp. I show it because these large polypi are rare of late; I have seen very few during the last few years. This lady was bleeding for four months and nothing was known as to the real condition; it was thought the neck of the womb had come down and that it was upside down. The lower part is eroded, and was ulcerated. There was constant bleeding, and when I tried to examine it three days before operation, I could hardly move it, it was only little by little that I could get away from the vaginal wall, permitting a stream of blood to run out, not knowing whether it was a polyp or a fibroid of the antero-posterior lip of the uterus, the impression being gained by my examination that the tumor and the uterus were all in one. I operated by the abdominal route. The lady was 52 years old.

DR. WM. M. THOMPSON: I wish to show a picture of a tumor of the ovary, weighing 100 pounds. This patient came to St. Joseph's Hospital on the 28th of March, and was operated on the 29th. She was 32 years of age, the mother of five children, all normal labors until the last one.

Before the last labor she noticed that she was growing very large. Two weeks before labor she thought the pains she was having meant the onset of labor. Physicians watched her for two weeks and then tapped her and drew off six gallons of fluid. Some weeks after labor five gallons more were drawn off.

Photograph of Dr. Thompson's patient.

She was brought to the hospital and I secured this photograph the morning of her operation. The circumference of the abdomen at the navel was 53 inches. She gave her weight as 200 pounds. I made a median incision, 9 inches long, and found the tumor adherent from the symphysis to the ensiform cartilage, and to the flanks on either side. I dissected up some of the adhesions, introduced a trocar and drew off 12 gallons of fluid, and then ligated and removed the tumor.

The case is interesting because of the size of the tumor, the fact that it grew rapidly, its small pedicle, the blood vessels in the pedicle being so small that it must have had its nutrition from the adhesions. I made numerous attempts to patch this tumor after its removal, so that it could be inflated, but failed; I got the small holes sufficiently covered, but there was a leakage all over the area that had been adherent.

This woman made an uneventful recovery. One gallon of the fluid weighed eight pounds and seven ounces, so that the total weight must have been over 100 pounds. The tumor proved to be a cyst of the left ovary with a narrow pedicle twisted 180 degrees. I have collected histories of thirty tumors, weighing over 100 pounds. The mortality is slightly over forty per cent, increasing in direct proportion to the weight of the tumor and its adhesions.

# ABSTRACTS OF CURRENT LITERATURE

## DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

JOHN B. MURPHY, M.D. — E. WYLLYS ANDREWS, M.D.
FREDERIC A. BESLEY, M.D. — WM. R. CUBBINS, M.D.

THE RECURRENT LARYNGEAL NERVE IN GOITRE OPERATIONS. By R. Stierlin.

This brochure of twenty-five pages furnishes the most detailed description of the anatomic relationship existing between the recurrent laryngeal nerve and the thyroid gland. The article is particularly admirable, in that it not only gives a clear anatomical picture, but also in that it states the various methods that have been recommended in order to avoid injuring the nerve. After considering these various methods Stierlin says that after all, the only safe method is to dissect out the nerve and thus have it in view during the course of the whole operation. He has followed this course in his last 150 goitre operations, and in only one instance has he had any symptoms referable to the recurrent.

His technic of doing a strumectomy, in brief, is as follows: Collar incision, division of the muscles in the middle line of the neck, retraction of the sterno-mastoid, and then careful division of the capsule of the thyroid. After the capsule is incised, the gland is gradually dislocated, by brushing the capsule away with gauze. Next, the inferior thyroid artery is felt for, located, and dissected free by blunt dissection. Great care must be used not to grasp the recurrent with a forceps during this stage of the operation. The artery is ligated and divided. The ligatures are left long, and are gently pulled upon, so as to aid in locating the nerve which usually runs behind the vessel, at that point where it branches. Stierlin describes a phenomenon which he calls the "Glockenzugphänomen," and which he uses to aid him in locating the nerve. The phenomenon consists in delicate fibrillary contractions along the course of the nerve, synchronous with the heart systole. These contractions are merely the transmitted pulsations of the aorta on the left or the subclavian on the right side around which vessels the nerves wind. The superior thyroid vessels are now ligated, then the isthmus is dissected free, clamped, and divided.— *Zeit. f. Chir.*, bd. lxxxiv, h. 1-4.

M. G. SEELIG.

SURGICAL THERAPY IN SPLENIC LEUCEMIA. By H. Lindner.

The fact that splenectomy for leucemia has been attended by such unfavorable results may be explained on the basis that the indications for the operation are not yet clearly crystalized. So far all deaths have been due to hemorrhage or collapse, therefore the operation should not be done in the advanced stages of the disease, nor in the presence of severe anemia or extensive adhesions. These adhesions ordinarily bleed most freely. If on the other hand the disease has not advanced very far, if the patient is in a fairly good condition, and if the spleen by its size and weight is causing pain, the operation is indicated on a symptomatic basis. The author quotes a case of a woman, 44 years old, who suffered a great deal from "spleen pain." The spleen was removed and the postoperative result was good. The number of leucocytes diminished rapidly and two years after the operation the patient felt perfectly well. The operation of course does not induce a radical cure, but it does do away with the pain and dangers consequent upon the enlargement of the spleen.— *Deutsch. Arch. f. klin. Med.*, bd. lxxxv, h. 1.

M. G. SEELIG.

SO-CALLED ENTEROPTOSIS AND ITS SURGICAL TREATMENT. By Theodore Rovsing.

Enteroptosis of the abdominal viscera has not received the attention that it merits, largely owing to the difficulty in diagnosis, but also because clinicians are too prone to attribute the symptoms caused by enteroptosis to a functional neurosis. The reason why these patients remain invalids so long is because there is such universal distrust in surgical aid that might be offered them. Rovsing believes that the word enteroptosis should be dropped and splanchnoptosis substituted for it. After stating the various theories of the etiology of the disease, the author states that it is well to divide all splanchnoptotic patients into two groups: 1. Women with intact strong abdominal walls; 2. Women with lax overhanging abdominal walls.

In the first class the disease may be considered as caused by corsets and a congenital weakness in the fixation of the abdominal organs. In the second class it is due to a lessened intra-abdominal pressure.

After describing in detail the symptom complex of the disease, devoting particular attention to gastroptosis and nephroptosis, Rovsing takes up the treatment of the condition, and divides this also into two parts: palliative treatment and radical operative treatment. Under palliative treatment he describes in detail the application of proper bandages, and states as a truism that bandages and belts are of absolutely no use in those cases where the abdominal wall is normal, and that they are often of no use in the presence of lax abdominal walls. As regards operative treatment he recommends nephropexy, gastrorrhaphy, gastroenterostomy and hepapotaxy. The indication for the performance of these operations, and the technical details of the operations themselves, are too complex to lend themselves to abstracting. In his conclusion Rovsing emphasizes the fact that these operations are attended with a distinct element of risk and that they should not be performed except in the presence of serious symptoms, and then only after all other means have proved futile.—*Volkmann's Vorträge*, No. 431. M. G. SEELIG.

THE PRESENT STATUS OF SPINAL ANESTHESIA. By Max Strauss.

In this article Strauss attempts to reach definite conclusions regarding the indications, contraindications, dangers and general value of spinal anesthesia. He bases his results not only on personal experiences with the method, but also on a most careful survey of the literature. In his report he includes the experience recorded in over eight hundred contributions in surgical literature. The article mirrors great care and an eminently fair and judicial attitude.

As a result of his investigations Strauss concludes that spinal anesthesia possesses a great many advantages when used on selected cases, that it is never free from danger, and that the only way to avoid danger is to select carefully those cases on which the method is to be used. He finds that tropacocaine is the safest anesthetic to use, that one grain of the drug is usually sufficient and that it is always better to use too small than too large a dose. The addition of adrenalin to the solution works harm rather than good. It is advisable to have the patient in the Trendelenburg position, and to withdraw a fair amount of cerebro-spinal fluid before injecting the drug. As a rule anesthesia extends from the lower abdominal region to the toes and lasts about an hour. Undesirable symptoms are best avoided by scrupulous attention to technic. The method is indicated in all cases in which the patient is old and weak, and therefore unable to take a general narcosis. It is contraindicated in young people, in neuropaths and psychopaths, in septic disease and in diseases of the brain and spinal cord. Particular care must be exercised in using it in the presence of tuberculous disease, lues, renal affections and advanced arteriosclerosis.—*Zeit. f. Chir.*, bd. lxxxix, h. 1–4.

M. G. SEELIG.

PROLONGED PRIAPISM. By F. Terrier and Ch. Dujarier.

Cases of priapism that are not dependent upon a lesion of the nervous system or associated with leukemia are pathological rarities. The authors report a case of this condition occurring in an individual in whom there were no lesions of the nervous system; the nervous examination was made by Babinski. The spleen, the lymphatic glandular system and the blood showed no deviation from the normal. There was no past or present evidence of gonorrheal infection. At time of admission to hospital the penis was in a state of erection and rested on the abdominal wall. The corpus spongiosum did not participate in the erection which involved the corpora cavernosa in their entire extent. Micturition was difficult, but not painful. No lesion of the prostate, seminal vesicles or testes. Terrier performed the following operation. An incision two centimeters in length was made upon the lateral surface of each corpus cavernosum; there was an outflow of thick blood, having the consistency of pitch, and the color of molasses; the penis became flaccid. The corpora cavernosa were sutured with catgut; the skin with silkworm gut. Aseptic dressing. Recovery.

Priapism is an erection unaccompanied by sexual desires, unassociated with voluptuous sensations; it is frequently truly painful. It is never followed by ejaculation. It may be acute or chronic; it may be permanent or temporary. Priapism must be differentiated from suppurative processes of the erectile tissues of the penis. In looking over the literature of the subject the authors have been able to collect only 48 cases of prolonged or persistent priapism which they report in detail. They have come to the conclusion that priapism (prolonged) may have a nervous, a traumatic, an inflammatory, a leukemic or an idiopathic (an unknown) origin.

In almost all the cases, the corpora cavernosa only were involved; in two of the cases, the entire penis was involved. The penis is usually applied to the abdominal wall; there are cases reported

where the incurvation was lateral; others, where it was inferior.

They strongly recommend that in these cases the skin and the fibrous tunic of the corpora cavernosa be incised separately, that the blood be expressed from these bodies. This is to be followed by a careful suture of the fibrous tunics of the corpora cavernosa, and closure of the skin incision. The separate suturing of the corpora cavernosa and of the skin prevents the formation of adhesions between the two. These adhesions interfere with erection. This operation has also been performed by Sick, by Mori. Their results were equally good. In cases that are treated by expectant measures, the corpora cavernosa undergo fibrous transformation, and erections of the penis can no longer occur. Hence, the value of operative treatment. — *Revue de Chirurgie*, Paris, No. 5, May 10, 1907.

AIMÉ PAUL HEINECK.

TECHNIQUE FOR EXPOSURE AND RESECTION OF THE CERVICAL SYMPATHETIC NERVE. By Pierre Sebileau and Anselme Schwartz.

Resection of the cervical sympathetic nerve for rebellious trifacial neuralgia was first performed in 1899 by Jaboulay. Since then Cavazzani, Chipault, Poirier, Delbet and Délagénière have performed this operation. The authors report a new case and as a result of their anatomical investigations recommend the following technique and give their reasons therefor. Their method exposes the sympathetic nerve by an anterior incision.

The sympathetic nerve is retro-arterial, not retro-venous. It is not in the carotid sheath. It is independent of it; internal to it. It is applied to the prevertebral muscles by a thin layer of cellular tissue. The direction, the length, and the topographical anatomy of the spinal accessory nerve is not the same in all individuals. The shorter it is, the more oblique is its course; the higher is its entrance into the substance of the sterno-cleido-mastoid muscle.

*Operation.* 1. Definitely locate the anterior border and the tip of the mastoid process.

2. Palpate the anterior border of the sterno-cleido-mastoid muscle from origin to insertion. The cutaneous incision is made along the anterior border of this muscle. It should extend upward as high as the lobule of the ear. Your incision is crossed by the external jugular vein and by the preauricular branch of the cervical plexus.

3. Open the sheath of the st. cl. m.m. along its anterior border.

4. Retract the muscle backward. This will make tension on the spinal accessory nerve. Having seen this nerve, you will not injure it during the course of the operation.

5. Seek the sympathetic nerve either above or below the spinal accessory nerve. The high operation is the more difficult.

6. Incise or separate the fibres of the posterior layer of the sheath of the sterno-cleido-muscle. This sheath conceals the large vessels of the neck.

7. Carotid sheath and its contents are retracted inwardly, that is mesially. The sympathetic nerve lies upon the prevertebral muscles. You will not confound it with the pneumogastric; the pneumogastric lies between and behind the two large vessels; it is somewhat retro-jugular. The sympathetic is retro-carotidian. It has two or three anastomotic branches to the cervical nerves. The pneumogastric has nothing of this nature.

8. Isolate nerve and then resect it. — *Revue de Chirurgie*, Paris, 1907.

AIMÉ PAUL HEINECK.

TRAUMATISM AS AN ETIOLOGICAL FACTOR IN APPENDICITIS.

The question of the relation of traumatism and the etiology of appendicitis has awakened interest among surgeons on account of the medico-legal aspect and its relations with accident insurance companies.

In discussing the part that traumatism plays in the production of acute or recurrent attacks of appendicitis two questions are to be considered:

1. Is it possible for injury, direct, as a blow upon the abdomen, or indirect, as by muscular contractions of the abdominal or iliopsoas muscles, to produce in a perfectly healthy appendix an acute attack of appendicitis?

2. Is it possible for injury to produce an acute attack of appendicitis when the appendix is diseased?

The author has never seen a case of acute appendicitis occur, in which injury was alleged as the direct exciting cause in an appendix that did not show some evidence of previous disease.

It is possible in an appendix, which is the seat of previous disease, that an injury can produce an attack of acute appendicitis.

Naumann, R. Fritz, Bottomby, MacDonald, Juengst, Blos, Karrenstein, Nordmann, Borchardt, Newman, Sonnenburg, Schroth and Atern are all in accord with author's view.

In conclusion the author calls attention to the following facts:

1. From personal experience and from a study of the cases found in the literature I do not consider that trauma is ever the direct exciting cause of acute appendicitis in a perfectly normal appendix.

2. I believe that an acute attack of appendicitis can follow a severe blow upon the abdomen or fall upon the abdomen, or be due to muscular contractions of the iliopsoas muscle in an appendix which has been previously inflamed only under the following conditions: (*a*) In a latent or residual abscess or extensive pathological lesion of the appendix where the organ is in close proximity to the anterior abdominal wall. (*b*) Strong contractions of iliopsoas muscle cannot in my opinion be the immediate cause of an acute attack of appendicitis, unless a chronically diseased appendix be firmly adherent to the peritoneum overlying this muscle. (*c*) The degree of traumatism, to be a factor in the causation of appendicitis, must be direct and of considerable force.

3. Acute attacks of traumatic origin are observed more frequently in males than in females, and between the ages of ten and twenty-five years.

4. The liability of an acute attack of appendicitis supervening upon injury is in direct ratio to the degree of injury, and depends entirely upon the pathological changes present in the appendix at the time of injury.

5. I maintain that it is exceedingly rare to find a case of acute appendicitis in which it can be definitely stated that traumatism is the direct exciting factor. This statement is borne out by a review of 1400 cases seen at the German Hospital in the past three years, and of this number in only one case was there any history of injury at all, and in this it was questionable whether the injury had anything to do in causing the attack.

In a review of the American, English, French, German and Italian literature it is a remarkable fact that of the great number of cases of acute appendicitis reported during the past forty to fifty years only 130 cases can be found in which traumatism has any bearing whatever, and of these only 13 cases can be directly attributed to traumatism for the production of the acute attack.

The author strongly urges a more careful study of this class of cases and, as soon as a diagnosis is made, insists upon an immediate operation if we are to obtain the best results.

### Pancreatic Cyst Following Traumatism.

Hardouin reports a case of pancreatic cyst which developed after a traumatism of the abdomen. The physical findings had led to the diagnosis of cyst of the lesser peritoneal cavity. After incision of the anterior abdominal wall in the median line, two quarts of a thick, turbid and brownish-green fluid were aspirated from the cyst. The cyst was then freely incised and the contents carefully mopped up. An attempt was made to extirpate the cyst in toto, but this had to be abandoned owing to the dense adhesions existing between the pouch and the neighboring organs, the stomach especially.

After thorough disinfection of the lumbar region, an incision 15 cm. in length was made along the outer border of the sacrolumbar mass. A forceps being introduced through the anterior opening made in the cyst, the latter was easily identified through the posterior incision. It was incised. Two large drainage tubes were introduced; the wound was packed with gauze. Returning to the anterior incision, the cyst was closed by careful suturing of its walls. The peritoneum was approximated and sewed on top of it. The abdominal wall was closed by later sutures. Drainage tube introduced and removed in twelve hours. Opening through which anterior tube escaped then closed. The lumbar fistula took three months to heal.

In pancreatic cysts, we can—

1. Extirpate.
2. Marsupialize.

Extirpation is the method of choice. It suppresses the tumor and all the complications incident to a persistent fistula. It eliminates the danger of carcinomatous change in the cyst. However, it is but rarely applicable, owing to the fusion of the walls of the pouch with neighboring organs, stomach, omentum, aorta (Gangolphe), rendering enucleation impossible. Nimier in six extirpations had four deaths.

Marsupialization, owing to its simplicity of technic and the good results which is given, is the method most generally adopted. The disadvantages of marsupialization are:

1. Carcinomatous degeneration of the cyst. This is rare. Only three cases have been reported.
2. Fistula formation. Many of these fistulae become permanent. Almost all of the authors have recommended draining through the anterior abdominal wall. The author believes with Siraud (Lyon) that the posterior route assures a more perfect drainage. By perfect drainage, he eliminates the three causes of persistent fistula:
1. Retention of an irritating liquid.
2. Infection of this liquid.
3. Secretion of the cyst.

The latter he checks by the injection of irritants that modify and destroy the secreting surface. These irritating agents can only be made use of safely when the posterior route is employed. He thinks that posterior drainage of pancreatic cysts will do away with the persisting pancreatic fistulae. —*Revue de Chirurgie*, May 10, 1907.

Aimé Paul Heineck.

SURGICAL FORMS OF ILEO-CECAL TUBERCULOSIS. By Henri Hartmann.

Ileo-cecal tuberculosis is far more amenable to surgical treatment than tuberculosis of other portions of the intestine. The author does not discuss tuberculous appendicitis, the treatment of which, he says, is that of ordinary appendicitis. The surgical forms of ileo-cecal tuberculosis have since 1892 been studied by Billroth, Hartmann, Conrath, Dieulafoy, Demoulin, Bérard et Patel, etc. The author reports cases treated operatively. The operations performed were determined by the conditions existing at the time of operation. Two main varieties are recognized: the entero-peritoneal form and the hypertrophic form. A few unusual forms occur.

In the entero-peritoneal form, usually both the lower end of the ileum and the cecum are the seat of ulcerations; the appendix is often destroyed. Caseous masses, tuberculous pus-collections are present. Abscesses are present; they may open into the lumen of the gut; may open externally, leading to the formation of sinuses, of fecal fistulae.

In the hypertrophic form (the most important for the surgeon), the pathological process is almost always limited to the cecum. The hypertrophic lesions extending, it is the colon which becomes most frequently involved. The entire ascending colon may be involved; the transverse colon may be invaded. The intestinal wall becomes rigid, its lumen becomes stenosed. The cul-de-sac formed normally by the cecum is effaced. A slight depression shows its former site.

Ileo-cecal tuberculosis occurs in both sexes with equal frequency. More common between the ages of twenty and forty years. May or may not be associated with tuberculosis elsewhere. In the former instance it is a food infection; in the latter, it is usually due to deglutition of tubercular sputa. Spontaneous cures do not occur. Unrelieved, death occurs within 3 years.

In making the diagnosis in the entero-peritoneal form exclude appendicitis, simple fecal fistula, actinomycosis, certain fistulae of osseous origin (vertebrale, pelvic bones); in the hypertrophic form, malignant disease must be excluded as well as stenosis due to other inflammatory causes.

The author states that the treatment is primarily surgical. As soon as the diagnosis is established, operation is indicated. In cases of glandular tuberculosis with subserous nodules, and no evidence of mucosal tuberculosis, an exploratory laparotomy may be followed by a cure. In most of the cases more active operative treatment will be necessary (partial resection of the cecum, ileo-colostomy, unilateral or bilateral intestinal exclusion, intestinal resection). When resection of the cecum is performed, the lymphatic glands occupying the ileo-cecal angle must be removed. They are always hyperplastic; frequently caseous. In these operations the author usually drains.— *Revue de Chirurgie*, Paris, Feb. 10, 1907.

AIMÉ PAUL HEINECK.

PULMONARY RUPTURES NOT ASSOCIATED WITH RIB FRACTURES. By A. Schwartz and P. Dreyfus.

Pulmonary ruptures unassociated with fracture of the ribs, though very infrequent, are not unknown. The authors report a case which they discuss in connection with 29 other cases which they have been able to find reported in the literature.

*Autopsy.* Small hemothorax. Blood in pleural cavity not coagulated. Absolute integrity of the parietal pleurae. Luxation of the right first and second costal cartilages at sternal junction. Beneath the visceral pleura of left lung are many blood-collections. This lung sinks in water. There was a linear tear in the middle of the inferior border of the left lung. Right lung — outside of slight traces of a sero-purulent bronchitis, negative. All other organs healthy.

The mechanism of these pulmonary contusions is as yet unexplained. From an anatomical-pathological standpoint, these lesions are classified in three degrees. In the first degree, there is a rupture of capillary vessels and the production of ecchymosis; in the second, more important vessels are torn and blood-collections are present in the lung; in the third degree, the pulmonary parenchyma is more or less torn in places, and the main vessels and main bronchi are injured. The seat of the lesions is variable; it may be central; it may be peripheral; it may be both. The seat of contusion is a favorable site for infection, most of these patients dying of traumatic pneumonia. In a few cases, death has been due to pulmonary gangrene; in some to pleural infection. The subcutaneous emphysema which was present in the case reported and which is reported present in 11 of the 29 tabulated cases is an important diagnostic sign. This emphysema first appears at the base of the neck, forming a crepitating, tympanitic supra-sternal swelling. It may become generalized. This sign proves that air has escaped into the peribronchial and mediastinal cellular tissues; it indicates that there is a pulmonary lesion.

The treatment is largely symptomatic; absolute rest in that position in which respiration is easiest, is most comfortable; anodynes and hypnotics to control restlessness. If a pneumothorax be present and is increasing in degree, aspiration or pleurotomy are indicated; if it be stationary, leave it alone.

# ABSTRACTS OF CURRENT LITERATURE

## DEPARTMENT OF GYNECOLOGY

UNDER THE CHARGE OF

J. Clarence Webster, M.D. — E. C. Dudley, M.D.
John C. Hollister, M.D. — F. W. Lynch, M.D.

Septic Abortion due to an Intra-uterine Pessary. By G. A. Wagner.

Reports of unfortunate results with the use of the intra-uterine stem pessary have become rare, undoubtedly on account of the fact that the great dangers of this therapeusis to-day are well appreciated not only by the specialist, but also by the general practitioner. At present, at least, all German authorities agree that the stem pessary proves of advantage only in extremely rare conditions. Among modern German text-books only that of Martin and Jung recommends the intra-uterine pessary in the treatment of amenorrhea and atrophy of the uterus.

Still very popular, possibly more so than ever before, is the stem pessary as a means of preventing conception. Its danger in this function is well illustrated by the case reported by Wagner.

A woman, 38 years old, had regularly menstruated up to August 28, 1906. On September 28th, she had a slight bloody discharge. Just a week before her admission she suddenly had taken sick with severe cramping pain in abdomen and backache. She had some fever and chilly sensations. Two days later she again felt well. Three days before admission she suddenly had a severe hemorrhage, followed by nausea, fever and chills. The patient arrived at the hospital in deep collapse. A slightly enlarged uterus was found in retroversion containing some necrotic tissue looking like decidua. The probable diagnosis of septic abortion was made. Since, however, certain symptomsstrongly suggested the possibility of rupture of a pregnant tube, an explorative laparotomy was performed. The abdomen contained some yellow fluid, but no blood. Both appendages were found in normal condition. Her bad general condition (icterus, etc.) next suggested a phosphorus intoxication, but any attempt at criminal abortion was stoutly denied by both the patient and her husband. Thirty-six hours later the patient died. At the post mortem examination an extensive necrosis of the interior of the uterus was ascertained, near the fundus the thickness of the uterine wall in one place being reduced to about one to two millimeters. These findings seemed to permit the assumption of a criminal instrumental abortion, when finally a new investigation revealed the true cause of this septic infection. The husband brought an intra-uterine pessary, a stem attached to a flat cup which fitted the vaginal portion of the cervix. This appliance had been used for some time and in the belief of the husband excluded the possibility that his wife was pregnant. The stem was seven cm. long, but nevertheless must have caused the injury found in the uterine fundus. This seems plausible in consideration of the fact that the uterus was retroverted and that undoubtedly the sharper end of the stem had been forcibly pressed against the fundus during cohabitation. Cases of injury and even perforation caused by stems shorter than the uterine cavity are on record. It is also well known that these pessaries do not reliably prevent impregnation, and thus the writer seems to have furnished convincing proof for his contention that in this case the stem pessary was responsible for the septic abortion which ended fatally.—*Septischer Abort durch ein Intra-uterin Pessar. Monatschr. für Geb. undG ynäk.*, bd. xxv, h. 4, p. 499.

Hugo Ehrenfest.

Plastic Resection of the Mammary Gland. By J. Collins Warren.

The operation described by Warren is designed to take the place of those exploratory incisions which are often inadequate for the purpose or are so situated as to leave an unsightly cicatrix, while, at the same time, every portion of the gland is freely exposed. Warren's incision is similar to that of Thomas, except that it is made to coincide with the edge of the outer hemisphere of the breast, thus offering freer access to the upper and outer quadrants, regions more frequently the seat of tumors. By extending the incision along the anterior border of the axilla, the breast can be thrown over towards the sternum, permitting complete exposure of the gland. Such an incision is quite completely concealed from view after recovery.

This dissection is to be carried down to the outer edge of the pectoralis major muscle, the breast is reflected, and an incision radiating from the center to the periphery of the gland should be made through the pectoral fascia. The segment of the gland containing the tumor may now be removed by two radiating incisions, including a V-shaped portion of tissue. The adipose tissue in front of this portion should also be removed to prevent subsequent depression at that point. No attempt should be made to dissect out either solid or cystic growths. Where cysts are present after removal of the cluster of larger ones, the remaining segments of the gland can be explored by radiating incisions. Smaller cysts in this way are laid open and minute ones snipped out with the scissors. Two or three of these secondary incisions are usually sufficient, though more may be required in the larger organs. Closure by sutures after mere exploration is rarely necessary, but after removal of tissue the edges should be lightly sutured. Warren emphasizes the point that only acinous tissues should be removed, saving all the cortical portion of the gland possible, together with surrounding adipose structure, so that all may be brought together by buried sutures in order to build up a breast normal in appearance. Upon being replaced the gland is anchored to the edge of the pectoral fascia, a second row of sutures being taken through the deep layer of the superficial fascia. Silk-worm gut is used externally.

In case the tumor is discovered to be of a malignant nature, Warren's incision is very readily extended into that for the radical operation.—*Annals of Surgery*, vol. xlv, No. 6, June, 1907.

CAREY CULBERTSON.

SPONTANEOUS EXPULSION OF A CANCEROUS UTERUS AFTER CAUTERIZATION WITH ZINC CHLORIDE. By Albert Blau.

Blau's case is that of a patient sixty-four years old, the mother of thirteen children, whose menopause occurred in her fiftieth year. She had been bleeding for three months and a diagnosis of carcinoma of the corpus and cervix, with extension to the parametrium was made. The carcinomatous mass was partly removed with the sharp curet and a short time later a thorough cauterization with a thirty per cent solution of zinc chloride was employed. Eight days later Blau removed from the vagina a loosened mass of the shape and consistency of the uterine body, 8 x 5½ cm., closed above and open below, like a sack. Microscopically this proved to be a sack-wall of unaltered muscle surrounding an inner layer of carcinomatous structure. The patient made an apparently speedy recovery and left the hospital in good condition.—*Spontane Ausstossung des karzinomatosen Uterus nach Ätzung mit Chlorzink. Zentralb. für Gynäk*, 1907, No. 4. CAREY CULBERTSON.

A MODIFICATION IN THE PERFORMANCE OF VENTRIFIXATION OF THE UTERUS. By Arthur J Wallace.

The author describes his modification of the usual operation as follows:

1. The lower part of the anterior surface of the uterus is grasped with volsellæ, and the organ is then drawn up towards the umbilicus so as clearly to expose the bottom of the utero-vesical pouch.

2. Picture a line starting from the center of this pouch and extending over the vesico-parietal peritoneum to the lower angle of the laparotomy wound. The peritoneum along this line is picked up with pairs of compression forceps, placed consecutively at distances of 1¼ in. to 1½ in. from one another, the lowest being placed about one inch from the bottom of the pouch and the highest exactly at the lower angle of the parietal wound. Care must be taken to avoid including the muscular wall of the bladder in the bite of the forceps.

3. Gentle traction on all the pairs of forceps now pulls up an actual ridge of peritoneum. From this ridge the diaphragm is made.

4. The next step consists — to borrow a dressmaker's term — in "gathering" the free border of this ridge, section by section, and fixing it with catgut sutures to the peritoneum of the bottom of the utero-vesical pouch. A long piece of catgut is passed through the peritoneum at the bottom of the pouch, and trebly knotted, one end being left longer than the other. The longer end is used for "gathering" the ridge, the shorter for knotting after each section is "gathered." As the process is carried out the uterus approaches gradually to the abdominal wall until its anterior wall lies actually in the laparotomy wound.

5. Ventrifixation proper can now be carried out. The author uses silk and places the lowest suture so that the points of entrance and exit in the parietal peritoneum are as close as possible to the parietal end of the septum just formed by the "gathering," the loop of the suture including that portion of the uterine musculature at the level of the bottom of the pouch.

Thus there is no isolated band and no potential opening. Moreover, this operation is not a vesico-fixation of the uterus. Bladder symptoms should not occur as a result, Wallace having had trouble of this kind but once in twenty cases.—*Jour. of Obstet. and Gynec. of the British Empire*, vol. xii, No. 2, August, 1907. CAREY CULBERTSON.

# ABSTRACTS OF CURRENT LITERATURE

## DEPARTMENT OF OBSTETRICS

UNDER THE CHARGE OF

C. S. BACON, M. D. — RUDOPLH W. HOLMES, M. D.
C. v. BACHELLÉ, M. D. — HUGO EHRENFEST, M. D.

KIDNEY FUNCTION IN PREGNANCY AND ECLAMPSIA. A series of very interesting cryoscopic examinations was carried out and reported by Büttner. These included the examination of the urines of healthy pregnant women, of women having the "pregnancy kidney," and of eclamptic women. The results were as follows:

The urine in the "pregnancy kidney," that under normal conditions and that of the convulsive stage of eclampsia showed the character of a typical kidney insufficiency, and cryoscopically they closely resemble the urine of a congested kidney, although the only thing that these conditions have in common is a poor circulation through that organ. This circulatory disturbance is caused in the convulsive stage of eclampsia and probably also in the other conditions mentioned by a contraction of the vessels in the kidney.

A similar condition of the circulation is also demonstrable, cryoscopically, in normal pregnancy, sometimes amounting only to a softening and edema of the kidney substance, at other times, however, actual lesions of the kidney epithelium appear or, in other words, the condition which he calls "pregnancy kidney."

As a result of this slowed kidney circulation, a low concentration of the body fluids exists which is typical of pregnancy and also suitable to the conditions. Because of this when edema develops in the course of pregnancy one cannot say that actual kidney insufficiency exists, nor even in the case of the "pregnancy kidney," for here the kidney attempts to adapt itself to the tendency of the body to lower the concentration of its fluids.

The circulatory disturbance occasionally causes such a marked impairment of nutrition of the kidney in these cases of "pregnancy kidney" and eclampsia that pronounced actual insufficiency sets in, which finally results in a marked increase of the molecular concentration of the blood. This, however, he believes, in itself has no bearing on the origin of eclampsia, because the latter is not the result of the presence of urinary constituents in the blood. The convulsive seizures are more probably due to arterial contraction in the brain, and whether or not a toxic substance must be absorbed to cause this arterial spasm and the pathologic changes that occur in eclampsia is not at all certain.— *Untersuchung über die Nierenfunktion bei Schwangerschaftsniere und Eklampsie. Archiv für Gynäkologie.* Bd. lxxix, Heft 2. C. V. BACHELLÉ.

HISTOLOGIC CHANGES DEVELOPING IN THE RETAINED PLACENTA. By Maria Berlin.

Berlin's investigations confirm the previous findings of Merttens and Franqué that after the death of the fetus those parts of the placenta in which maternal circulation remains undisturbed, will continue their normal vegetative function. The only change caused by the extinction of fetal life is possibly a retardation of both circulation and growth of the placental tissue, which at times lead to changes in the intervillous spaces. The syncytium continues its normal action. Especially in the latter half of pregnancy its main function consists in the absorption of the necessary amount of nutritive material from the maternal blood and in passing the same to the villi. Since fetal circulation has ceased, in these retained placentas the material absorbed accumulates in the stroma of the villi and there causes an edematous swelling, or if taken up by the endothelium of the capillaris and arterioles leads to a proliferation of this endothelium. The final outcome of this latter process is the complete or partial obliteration of these vessels, a most common finding in these placentas.— *Ueber Veränderungen in retinierten Placenten. Hegar's Beitr. zur Geb. und Gynäk.*, bd. xi, h. 3.

HUGO EHRENFEST.

THE RESULTS OF BLOODCOUNTS IN OBSTETRICS AND GYNECOLOGY. By R. Blumenthal.

For the purpose of determining the presence of pus the examination of the blood can be limited to a leucocyte count and to a calculation of the percentage of polynuclear neutrophiles. The best results are obtained if the examination is made at the time when the temperature is the highest, but

if in a certain case the very beginning of a suppurative process is to be ascertained, repeated examinations would have to be made every time the temperature rises. During menstruation the number of the eosinophiles is increased, but without a leucocytosis. Pregnancy is often accompanied by an anemia, while a leucocytosis is rather uncommon. If it does exist, it consists in a neutrophile polynucleosis, and this obviates the possibility of diagnosing pus from the condition of the blood. A marked leucocytosis, due to an increase in the number of the neutrophile polynuclears is typical during labor, and is most pronounced in the very last stage of labor. During labor the eosinophiles disappear from the blood. Immediately after labor the blood promptly begins to change to its normal condition. The beginning of secretion of milk marks the reappearance of the eosinophiles, which at first may be found in abnormally large numbers. After lactation is well established the constitution of the blood is about normal. This state is reached within one week after labor, if the puerperal state is normal. Any complication of the latter tends to produce a leucocytosis. The diagnosis of pus from blood findings, therefore, is impossible during labor. It, however, seems feasible during pregnancy and the puerperium, especially if the constitution of the blood was known through previous examinations.

THE REFLEX INFLUENCE OF BREASTS AND UTERUS UPON EACH OTHER. By E. M. Kurdinowski.

The close physiologic relation existing between mammae and uterus is a well established fact, already mentioned by Hippocrates. In the course of his interesting studies of the physiology of the uterus, carried out by means of his ingenious method of experimentation, Kurdinowski succeeded in obtaining a curve exactly registering the motoric effect of a mechanic irritation of the nipple upon the musculature of both the pregnant and non-pregnant uterus. It occurred to him that possibly the same reflex effect could be exerted also by irritation of other parts of the body. Further experiments furnished convincing proof for the justification of his assumption. This article of Kurdinowski explodes the old theory of the specific effect of irritation of the nipple area upon the uterine muscle. It would seem that reflex influences, arising from all sorts of peripheral irritation, form a very important and almost continuous source of impulses for uterine contractions.

In Kurdinowski's opinion the fact, that the uterus seems extremely susceptible to all reflex influences, permits the deduction that in return all impulses originating within the uterus by way of reflex action also must easily be transmitted to all other, even distant organs in the body. In this way he wishes to explain all the nervous symptoms accompanying normal menstruation and thinks that it is extremely plausible that all the typical molimina of pregnancy are produced by certain irritations transmitted from the hyperemic and enlarged uterus by way of the sympathetic system to the various organs. He considers this explanation even applicable to such conditions as hyperemesis gravidarum, ptyalism and a psychosis developing during pregnancy.—*Ueber die reflectorische Wechselbeziehung zwischen den Brustdrüsen und dem Uterus, etc. Archiv für Gynäkologie*, bd. 81, h. 2, p. 340.

HUGO EHRENFEST.

PULMONARY TUBERCULOSIS AND ARTIFICIAL INTERRUPTION OF PREGNANCY. By P. J. de Bruine Ploos van Amstel.

"Is pulmonary tuberculosis an indication for the artificial interruption of pregnancy?" is the question to which the writer of this very instructive paper attempts to furnish a "clear and precise answer." The answer is in the affirmative, and almost a hundred pages are taken up with the arguments advanced by the writer in support of his position concerning this problem. The question is considered in all its aspects, including the moral and legal, numerous and extensive quotations are given from the literature, and each quotation, each cited opinion is subjected to a sharp critical scrutiny. The final deductions of this essay are based upon a very careful consideration of an enormous amount of material, and, therefore, demand the attention of every physician who may be called upon to pass judgment concerning the proper mode of procedure in a case of pregnancy complicated by a pulmonary phthisis.

A study of the laws of most of the European countries reveals the unsatisfactory condition that in most instances no distinct provisions are made that the physician who performs an abortion for medical reasons in an effort to save the mother's life, is exempt from punishment. The writer advises strongly such changes as will make this point perfectly clear.

Next, in taking up the purely medical side of the problem, the essayist endeavors to formulate an answer to the question: "Does tuberculosis show an untoward effect upon pregnancy?" Practically all authorities agree that such a harmful effect is exerted. While most writers believe that abortions and premature births are very frequently caused, Ploos thinks that this result is not very common, at least not in the early stage of the disease.

More difficulty is encountered in furnishing a definite answer to the second question: "What is the condition and future of children born by these mothers?" In a few well authenticated cases children have been born with the unmistakable signs of a tuberculosis. Theoretically a direct infection of the ovum through an infected spermatoid, like in syphilis, might be assumed, but the existence of this mode of infection has never been established. A placental transmission of tubercle bacilli to the fetus is possible, but certainly is a rare occurrence. Of greater practical importance is the increased predisposition to infection which children of tuberculous parents show, and the increased risk of acquiring the infection by the close association with their diseased parents. A hereditary predisposition for tuberculosis is almost generally conceded. The imminent danger existing for these children of acquiring the infection at home is well illustrated by such observations as made *e. g.* by Bernheim. In three sets of twins he permitted the respective mothers to nurse one child of each set, while the other was turned over to a wet nurse. All three babies nursed by their own mothers died, while the three others survived.

The essayist comes closer to the chief topic of his paper with his third and fourth question: "Have pregnancy, labor and the puerperium a harmful effect upon the course of a pulmonary tuberculosis, and if so, does this fact justify abortus provocatus?" In general it can be stated that such a harmful effect does exist; it is more pronounced in labor and during the puerperium than in the course of pregnancy. The essayist is willing to accept Kaminer's *dictum*: "It is usually a misfortune for a tuberculous woman to become pregnant." A woman predisposed to tuberculosis may develop an acute phthisis during pregnancy, but more often she will exhibit the first symptoms in the puerperal state. The practical conclusions to be drawn from these facts are the following: It is the duty of the physician to warn a tuberculous girl against marriage, a married woman against impregnation. Ploos regrets the fact that European countries do not possess laws prohibiting the marriage of persons suffering from tuberculosis, and points with envy to the advanced position taken by some of the United States. If the physician is consulted after impregnation has occurred, he must inform the prospective mother of the fact that her pregnancy must be regarded a serious complication of her tuberculosis, and he should advise immediate interruption of the pregnancy. Since with the advance of both the disease and pregnancy the danger increases proportionately, the indication and justification for artificial abortion are most evident in the earlier stages of both the disease and the pregnancy. But the indication for abortion undoubtedly also exists in far advanced cases of tuberculosis. If the mother is in an entirely hopeless condition, premature birth may be resorted to in an attempt to save a viable fetus. It may be emphasized that the essayist repudiates the restriction made by some writers to the effect, that artificial abortion should be performed only after a deterioration in the mother's condition has become noticable. He defends his radical position with his observation that the chances of being born healthy and strong are very slim for children of tuberculous mothers.

The author's fifth question reads: "Does abortion check that rapid progress of the phthisis for which pregnancy is held responsible?" The answer is not very precisely given, but if we understand correctly the writer's idea, we would formulate it as follows: Abortion positively checks the progress of the disease in some instances, but it certainly always removes a decidedly injurious factor. Of course, if pregnancy is interrupted very late, the harmful influence has been potent for a long time; the patient is in a bad condition and the immediate harmful effect of labor itself may upset the possible beneficial effect to be expected from the interruption of the pregnancy. All these arguments then would speak in favor of early abortion.

The writer finally propounds his last question: "Which method of artificial abortion is the least dangerous to the patient?" Certainly a method which does not call for a general anesthesia. For early abortion Ploos recommends the method of Oehlschlaeger which consists in the injection of three to four grams of tincture of iodine into the uterine cavity. This injection, whenever possible, should be made a few days after the expected menstruation has failed to appear. If done in later months of pregnancy, it should be accompanied or followed by a curetment. An abortion in the third or fourth month requires the instrumental dilatation of the cervix for the introduction of two fingers. The ovum is freed and expressed, then the uterine cavity curetted.—*Phthisis Pulmonum und Abortus Provocatus. Beiträge zur Klinik der Tuberkulose.* Bd. vii, H. 2, 1907.

HUGO EHRENFEST.

# BOOK REVIEWS

SURGICAL DIAGNOSIS. By Daniel N. Eisendrath, A. B., M. D. Adjunct Professor of Surgery in the Medical Department of the University of Illinois (College of Physicians and Surgeons). Attending Surgeon to the Michael Reese and Cook County Hospitals, Chicago. W. B. Saunders Co., Publishers, 1907.

This is a volume of convenient size, about 775 pages, dealing with the diagnosis of surgical affections and injuries. No attempt is made to go into questions of treatment. The book is one which is well adapted to the uses of the practicing surgeon who desires information concisely and accurately given, and should also be of great value to the student, as its systematic construction renders it a very easy book to consult. Nothing of diagnostic importance is omitted, yet the author does not run into endless detail.

Surgical affections of the head are first considered, the differential diagnosis of various forms of intracranial injury being carefully gone into. The various injuries and diseases about the face and jaws are fully discussed, the question of tumors of the jaws being, in particular, well handled.

Tumors of the neck are given a full consideration and the difficult points in their differential diagnosis well brought out.

The diagnosis of abdominal conditions is particularly well handled. The various subjects are discussed fully and clearly, and the chapter as a whole impresses one as one of the strongest in the book. Diagrams are freely used in elucidating the anatomy of hernia and for indicating locations of lesions in the genito-urinary tract.

Diseases of the bones and joints also take up a generous share of the author's attention, and the fractures and dislocations are illustrated by numerous reproductions of skiograms, drawings and diagrams.

A valuable feature of the work is the section on post-operative complications, these being treated in a concise though not too abreviated manner.

Various methods of examination are discussed in the last chapter, the more important ones being described fully. Especial attention is given to blood changes.

The reader is impressed particularly with the number and character of the illustrations, of which 482 appear. These are well selected and bear evidence of much work in preparation. But few of the old familiar illustrations which one has seen reproduced time and again in various books are found. Diagrams are freely used when needed.

The mechanical work is excellent, the type large and clear, and the book is fully indexed. The book fills a useful place and will undoubtedly find a ready welcome from both student and practitioner.

W. C. DANFORTH, M. D.

DISEASES OF THE LUNGS. By Robert H. Babcock, A.M., M.D. D. Appleton and Company, New York; 1907. Cloth, $6.00.

Those who are familiar with Dr. Babcock's book on diseases of the heart will welcome this companion treatise on diseases of the lungs and pleura. The same good qualities that have won for the author's earlier work its wide vogue, characterize the present volume. His presentation of the subject is intensely practical and is so vital and direct throughout as to hold the attention in a rare manner. As stated, the author has designed this work especially for the use of students and practitioners, and so well has he accomplished this object that we know of no book on the subject that can be read with greater interest and profit than the one before us. The press work of the volume is excellent, and the illustrations are well chosen and artistically executed.

No remarkable strides have been made in very recent years in our knowledge of pulmonary diseases, and yet contributions to the subject have been many and valuable, and our progress in certain clinical ways carries us far forward in our appreciation of the etiology and treatment of this important class of diseases.

One naturally turns to the chapters of Pneumonia and Tuberculosis with the greatest interest. The space allotted to these subjects is commensurate with their importance. The various clinical phases of pneumonia are presented with unusual clearness, illustrative cases from the author's rich experience being freely used to emphasize difficult points in diagnosis.

At the present time there appears to be a tendency to relegate to a very secondary place in diagnosis the symptomatology and clinical history, emphasis being shifted to the results of physical examination and laboratory investigation. It is, we think, open to question whether we are not going too far in our neglect of the clinical history.

Dr. Babcock's book contains many passages which reveal how illuminative, from a diagnostic standpoint, a well systematized symptomatic enquiry may become. In fact, one of the chief of the many excellencies of this book is its clinical narratives. This is in no way allowed to detract from the physical and laboratory diagnosis, but renders progress in these directions more concrete and exact. The author deprecates the employment of so-called abortive measures in pneumonia, and is strong in his condemnation of cardio-depressants in this disease. His discussion of the treatment of pneumonia — always a difficult theme and one on which we all seek enlightenment — is evidently based on his own personal experience, and will be found helpful and suggestive.

Over two hundred pages of text are devoted to the consideration of pulmonary tuberculosis. Those interested in this vital subject will find here an excellent presentation of its various social and clinical aspects. The chapter on diagnosis is especially to be commended. The author presents a general review of the so-called crusade against tuberculosis. He discusses in detail the modern hygienic treatment of the disease. The value of dietetic treatment is strongly accented, the author emphasizing the folly of leaning too heavily on the broken reed of climate to the neglect of more rational systematic methods of treatment. His condemnation of so-called specific drug therapy in this disease is unfortunately still needed, for, notwithstanding the advance of our knowledge, the myth of specific medicinal treatment in tuberculosis still retains a considerable hold upon the minds of the profession.

Fungous diseases of the lungs receive consideration in an interesting chapter, and pulmonary syphilis is accorded the space its importance warrants. The concluding portion of the book is devoted to diseases of the pleura.

By way of criticism, it seems to the reviewer that a more extended consideration of hypostatic congestion and pulmonary edema might with advantage be given, because of their frequency, and the work of Killian and others with the bronchoscope is deserving of more detailed reference.

Dr. Babcock has given us a valuable and interesting book, and is to be heartily congratulated.

A. R. E.

DIAGNOSTICS OF THE DISEASES OF CHILDREN. By LeGrand Kerr, M.D., Professor of Diseases of Children in the Brooklyn Postgraduate Medical School, etc., pp. 542. W. B. Saunders Co.

This admirable new work has just appeared as a valuable addition to our pediatric literature. The author has evidently had wide experience, is a keen, thoughtful observer and a clear writer. Nothing commends this volume more than his earnest plea for a "square deal" for the baby in the introduction. This spirit pervades the whole book. It is intended as a practical aid to bed-side diagnosis for the general practitioner. The headings of chapters, for this reason, are symptoms rather than diseases, with the differential diagnosis often under the most prominent symptom — as, for example, "pertussis" under "cough." No more thoroughly reliable and preëminently practical book on the subject can be found in the English language.

JOSEPH BRENNEMANN.

PRACTICAL GYNECOLOGY. By Montgomery. Third revised edition. Philadelphia: P. Blakiston's Son & Co.

The appearance of a third edition within a short space of time is evidence of its popularity and value. The work reflects the valuable experience of one who has had a large practice and who has contributed much to the literature of gynecology. There is very much to commend and very little to criticise in the book.

The arrangement into "sections rather than chapters" is a degression from the usual text-book arrangement and has its advantages. The book is encyclopedic in arrangement, but the limitation as to size has made it necessary to treat of some of the subjects rather briefly. Some of the newer operations for cases of extensive cystocele and uterine prolapse are not given. It is very probable that self-retaining catheters do more harm than good in the aftercare of operations for vesical fistulæ.

We believe that Montgomery's vast experience in and knowledge of gynecology would justify him in including only what he considers important, especially as regards treatment. The book, however, throughout reflects the author's personality.

The illustrations are numerous and excellent. The very complete table of contents and index facilitate very much the use of the book for reference. The paper, type and general construction do credit to the well-known publishers.

THOMAS J. WATKINS.

THE PRINCIPLES AND PRACTICE OF DERMATOLOGY. Designed for Students and Practitioners. By William Allen Pusey, A.M., M.D. Professor of Dermatology in the University of Illinois; Dermatologist to St. Luke's and Cook County Hospitals, Chicago; Member of the American Dermatological Association. With one colored plate and three hundred and sixty-seven text illustra-

tions. New York and London: D. Appleton & Company. 1907.

Dr. Pusey's book is a work of one thousand pages, illustrated with one colored plate and three hundred and sixty-seven text illustrations.

It is written in a pleasing, readable style, and the author has eliminated to a large extent repetitions in description of the various disorders, which is a hard task in text-book writing in dermatology.

The chapters on anatomy and general pathology are unusually complete and embody the chief facts demonstrated by modern research along these lines. The chapter on general treatment is also comprehensive and excellently gotten up.

The classification of the author is a departure, and although based on different foundations (a part being the original classification of Hebra, a part based on clinical facts, and still another on etiological grounds) taken as a whole the matter is apparently simplified. Classification has long been a "bone of contention" and must remain so until greater knowledge is added to the entire subject.

The various individual chapters are concise and still embody the chief facts necessary in the descriptions of the particular diseases under discussion.

The illustrations are abundant and are largely from the author's collection and add greatly to the value of the work.

ATLAS AND EPITOME OF DISEASES OF CHILDREN. By Dr. R. Hecker and Dr. J. Trumpp (Munich). Edited by Dr. Isaac A. Abt, Chicago. 1907.

This neat little volume of 485 pages is the most recent of the series of atlases sent out by Saunders, that are intended to teach by pictures rather, more than by text. It is intended primarily for those who have had limited opportunity to familiarize themselves with clinical pictures of diseases of children either in clinics or in practice. It contains 48 very lifelike colored plates and 147 black and white illustrations, that have been chosen with great care to show a large number of typical conditions. The text plays no very secondary part, and in itself is as clear, concise, and useful an epitome of diseases of children as is found anywhere. While especially instructive as to symptomatology and diagnosis, the therapeutics is very satisfactorily dealt with. Valuable additions, enclosed in brackets, are made by the editor whose work and wide experience give assurance to the American readers of the value and reliability of this volume. It is to be regretted that brackets were not used a little more freely in places — notably when he leaves unchallenged the statements that a baby ought to be nursed "every 2 hours, later every 3 hours," and that mother's milk should be administered to a premature babe "with a spoon through the nose." On the whole the book is a clear cut, reliable epitome of present day pediatrics with a wide range of usefulness.

JOSEPH BRENNEMANN, M. D.

THE IMMEDIATE CURE FOR THE INJURED. By Albert S. S. Morrow, M. D., Attending Surgeon to the Workhouse Hospital and to the New York City Home for the Aged and Infirm. Octavo, 340 pp., with 238 illustrations. Philadelphia and New York: Lea Brothers & Co. 1906. Cloth, $2.50 net.

This book is one that should be in the hands of every intelligent layman, though it will well repay a thorough perusal by every practitioner and nurse.

The simplicity of its style and the small number of technical terms make it very readable, while the unusually large number of well selected illustrations — many of them original — add clearness to the explanations. Thirty-two columns of Index make the matter of reference a pleasure.

The work is a modern one in every sense; it tells just what to do in an emergency, and it is well classified. There are chapters on bandaging, practical remedies, accidents, hemorrhages, burns and scalds, sprains, poisons and their antidotes, etc. It is essentially a work on *first aid*, re-enforced by a condensed and well arranged description of the anatomy and physiology of the human body, in ten brief chapters. Part II is devoted to bandaging, dressings, remedies, etc., their method of application being thoroughly explained. Part III includes a valuable chapter on "Transportation of the Injured," which follows, in the main, the drill regulations of the United States Army Hospital Corps, but simplified to conform to the text. The chapter on antiseptics is a very valuable one.

On the whole the book is eminently practical, easily read and handy for reference.

W. E. DODGE.

## BOOKS RECEIVED

PRACTICAL FEVER NURSING. By Edward C. Register, M.D., Professor of the Practice of Medicine in the North Carolina Medical College. Octavo volume of 352 pages, illustrated. Philadelphia and London: W. B. Saunders Company. 1907. Cloth, $2.50, net.

FIVE HUNDRED SURGICAL SUGGESTIONS. Practical Brevities in Surgical Diagnosis and Treatment. By Walter M. Brickner, B.S., M.D., Chief of Surgical Department, Mount Sinai Hospital Dispensary, New York; Editor-in-Chief American Journal of Surgery, and Eli Moschcowitz, A.B., M.D., Assistant Physician Mount Sinai Hospital

Dispensary, New York; Associate Editor American Journal of Surgery. Second Series. 12 mo. 125 pages. New York: Surgery Publishing Company, 92 William St. 1907. Price $1.00.

ANATOMY OF THE BRAIN AND SPINAL CORD. With Special Reference to Mechanism and Function. For Students and Practitioners. By Harris E. Santee, M.D., Ph. D., Professor of Anatomy in the College of Physicians and Surgeons, Medical Department University of Illinois; Professor of Anatomy in Jenner Medical College, Chicago; Member of Association of American Anatomists. Fourth Edition, revised and enlarged. With 128 illustrations, 33 of which are printed in colors. Philadelphia: B. Blakiston's Son & Co. 1907. Price $4.00, net.

A MANUAL OF SURGERY. For Students and Physicians. By Francis T. Stewart, M.D., Professor of Surgery Philadelphia Policlinic; Associate in Surgery Jefferson Medical College; Surgeon to the Germantown Hospital; Out-Patient Surgeon to the Pennsylvania Hospital. With 504 illustrations. Philadelphia: P. Blakiston's Son & Co. 1907. Price $3.50, net.

FRONTALER GEFRIERDURCHSCHNITT durch die Beckenorgane einer an Ruptura Uteri bei verschleppter Querlage verstorbenen Kreissenden. Von Privatdozent Dr. Wilh. Zangemeister. Mit 4 Tafeln und 11 Abbildungen. Leipzig: Verlag von C. F. Vogel. 1907.

GYNECOLOGY AND ABDOMINAL SURGERY. Volume 1. In two large octavos. Edited by Howard A. Kelly, M.D., Professor of Gynecologic Surgery at Johns Hopkins University; and Charles P. Noble, M.D., Clinical Professor of Gynecology at the Woman's Medical College, Philadelphia. Large octavo volume of 851 pages, with 405 original illustrations by Mr. Hermann Becker and Mr. Max Brodel. Philadelphia and London: W. B. Saunders Company. 1907. Per volume: Cloth, $8.00, net; Half Morocco, $9.50, net.

DISEASES OF THE INTESTINES AND PERITONEUM. American Edition of Nothnagel's Practice. By Dr. Hermann Nothnagel, of Vienna. Edited, with additions by H. D. Rolleston, M.D., F.R.C.P., Physician to St. George's Hospital, London, England. Second Edition. Octavo of 1059 pages, illustrated. Philadelphia and London: W. B. Saunders Company. 1907. Cloth, $5.00, net; Half Morocco, $6.00, net.

TREATMENT OF THE DISEASES OF CHILDREN. By Charles Gilmore Kerley, M.D., Professor of Diseases of Children, New York Policlinic Medical School and Hospital, etc. Octavo volume of 597 pages, illustrated. Philadelphia and London: W. B. Saunders Company. 1907. Cloth, $5.00, net; Half Morocco, $6.50, net.

SURGERY: ITS PRINCIPLES AND PRACTICE. In five volumes. By 66 eminent surgeons. Edited by W. W. Keen, M. D., LL.D., Hon. F. R.C.S., Eng. and Edin., Professor of the Principles of Surgery and of Clinical Surgery, Jefferson Medical College, Philadelphia. Volume II. Octavo of 920 pages, with 572 text illustrations and 9 colored plates. Philadelphia and London: W. B. Saunders Company. 1907. Per volume: Cloth, $7.00, net; Half Morocco, $8.00, net.

A MANUAL OF DISEASES OF THE NOSE, THROAT AND EAR. By E. Baldwin Gleason, M.D., Clinical Professor of Otology at the Medico-Chirurgical College, Philadelphia. 12mo. 556 pages, profusely illustrated. Philadelphia and London: W. B. Saunders Company. 1907. Flexible leather, $2.50 net.

THE PRACTICE OF OBSTETRICS. By American Authors. Edited by Charles Jewett, M. D., Professor of Obstetrics and Gynecology in Long Island Hospital, New York. Third edition, revised and enlarged. Illustrated with 484 engravings, 46 of which are in colors and 35 colored plates. New York and Philadelphia: Lea Brothers & Co. 1907.

DISEASES OF THE RECTUM. Their Consequences and Non-Surgical Treatment. By W. C. Brinkerhoff, M. D., Chicago, Organ Publishing Company. 1907. Price $2.00.

AMERICAN PRACTICE OF SURGERY. A Complete System of the Science and Art of Surgery, by Representative Surgeons of the United States and Canada. Editors: Joseph D. Bryant, M. D., LL. D., and Albert H. Buck, M. D., of New York City. Complete in eight volumes. Profusely illustrated. Vol. III. New York: William Wood & Company. 1897.